APPENDICES

APPENDIX A

California Water Code Section 10750 et. seq.
Groundwater Management

CALIFORNIA WATER CODE SECTIONS ON GROUNDWATER MANAGEMENT
Prepared by Tim Parker, Parker Groundwater
Excerpts from the CA Water Code – March 2012
Available on the web at WWW.LEGINFO.CA.GOV

10750. (a) The Legislature finds and declares that groundwater is a valuable natural resource in California, and should be managed to ensure both its safe production and its quality. It is the intent of the Legislature to encourage local agencies to work cooperatively to manage groundwater resources within their jurisdictions.
b) The Legislature also finds and declares that additional study of groundwater resources is necessary to better understand how to manage groundwater effectively to ensure the safe production, quality, and proper storage of groundwater in this state.

10750.2. (a) Subject to subdivision (b), this part applies to all groundwater basins in the state.
(b) This part does not apply to any portion of a groundwater basin that is subject to groundwater management by a local agency or a watermaster pursuant to other provisions of law or a court order, judgment, or decree, unless the local agency or watermaster agrees to the application of this part.

10750.4. Nothing in this part requires a local agency overlying a groundwater basin to adopt or implement a groundwater management plan or groundwater management program pursuant to this part.

10750.6. Nothing in this part affects the authority of a local agency or a watermaster to manage groundwater pursuant to other provisions of law or a court order, judgment, or decree.

10750.7. (a) A local agency may not manage groundwater pursuant to this part within the service area of another local agency, a water corporation regulated by the Public Utilities Commission, or a mutual water company without the agreement of that other entity.
(b) This section applies only to groundwater basins that are not critically overdrafted.

10750.8. (a) A local agency may not manage groundwater pursuant to this part within the service area of another local agency without the agreement of that other entity.
(b) This section applies only to groundwater basins that are critically overdrafted.

10750.9. (a) A local agency that commences procedures, prior to January 1, 1993, to adopt an ordinance or resolution to establish a program for the management of groundwater pursuant to Part 2.75 (commencing with Section 10750), as added by Chapter 903 of the Statutes of 1991, may proceed to adopt the ordinance or resolution pursuant to Part 2.75, and the completion of those procedures is deemed to meet the requirements of this part.
(b) A local agency that has adopted an ordinance or resolution pursuant to Part 2.75 (commencing with Section 10750), as added by Chapter 903 of the Statutes of 1991, may amend its groundwater management program by ordinance or resolution of the governing body of the local agency to include any of the plan components set forth in Section 10753.7.

10750.10. This part is in addition to, and not a limitation on, the authority granted to a local agency pursuant to other provisions of law.

10752. Unless the context otherwise requires, the following definitions govern the construction of this part:
(a) "Groundwater" means all water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water that flows in known and definite channels.
(b) "Groundwater basin" means any basin or subbasin identified in the department's Bulletin No. 118, dated September 1975, and any amendments to that bulletin, but does not include a basin in which the average well yield, excluding domestic wells that supply water to a single-unit dwelling, is less than 100 gallons per minute.
(c) "Groundwater extraction facility" means a device or method for the extraction of groundwater within a groundwater basin.
(d) "Groundwater management plan" or "plan" means a document that describes the activities intended to be included in a groundwater management program.
(e) "Groundwater management program" or "program" means a coordinated and ongoing activity undertaken for the benefit of a groundwater basin, or a portion of a groundwater basin, pursuant to a groundwater management plan adopted pursuant to this part.
(f) "Groundwater recharge" means the augmentation of groundwater, by natural or artificial means, with surface water or recycled water.
(g) "Local agency" means a local public agency that provides water service to all or a portion of its service area, and includes a joint powers authority formed by local public agencies that provide water service.
(h) "Person" has the same meaning as defined in Section 19.
(i) "Recharge area" means the area that supplies water to an aquifer in a groundwater basin and includes multiple wellhead protection areas.
(j) "Watermaster" means a watermaster appointed by a court or pursuant to other provisions of law.
(k) "Wellhead protection area" means the surface and subsurface area surrounding a water well or well field that supplies a public water system through which contaminants are reasonably likely to migrate toward the water well or well field.

10753. (a) Any local agency, whose service area includes a groundwater basin, or a portion of a groundwater basin, that is not subject to groundwater management pursuant to other provisions of law or a court order, judgment, or decree, may, by ordinance, or by resolution if the local agency is not authorized to act by ordinance, adopt and implement a groundwater management plan pursuant to this part within all or a portion of its service area.
(b) Notwithstanding subdivision (a), a local public agency, other than an agency defined in subdivision (g) of Section 10752, that provides flood control, groundwater management, or groundwater replenishment, or a local agency formed pursuant to this code for the principal purpose of providing water service that has not yet provided that service, may exercise the authority of this part within a groundwater basin that is located within its boundaries within areas that are either of the

following: (1) Not served by a local agency. (2) Served by a local agency whose governing body, by a majority vote, declines to exercise the authority of this part and enters into an agreement with the local public agency pursuant to Section 10750.7 or 10750.8.
(c) Except as provided in subdivision (b), this chapter does not authorize a local agency with authority to manage groundwater planning within the service area of another local agency.
(d) Except as otherwise provided in this part, the process for developing and adopting a revised groundwater management plan shall be the same as the process for developing and adopting a new groundwater management plan.

10753.1. Nothing in this part, or in any groundwater management plan adopted pursuant to this part, affects surface water rights or the procedures under common law or local groundwater authority, or any provision of law other than this part that determines or grants surface water rights.

10753.2. (a) Prior to adopting a resolution of intention to draft a groundwater management plan, a local agency shall hold a hearing, after publication of notice pursuant to Section 6066 of the Government Code, on whether or not to adopt a resolution of intention to draft a groundwater management plan pursuant to this part for the purposes of implementing the plan and establishing a groundwater management program.
(b) At the conclusion of the hearing, the local agency may draft a resolution of intention to adopt a groundwater management plan pursuant to this part for the purposes of implementing the plan and establishing a groundwater management program.
(c) The local agency shall provide to the department a copy of a resolution of intention adopted pursuant to this section within 30 days of the date of adoption. The local agency shall also provide to the department contact information for the person in charge of drafting the groundwater management plan.
(d) The department shall post on its Internet Web site information it possesses regarding groundwater management plans being prepared or adopted pursuant to this part, including information provided by local agencies identified pursuant to this section, and monitoring entities identified pursuant to Sections 10928 and 10930.

10753.3. (a) After the conclusion of the hearing, and if the local agency adopts a resolution of intention, the local agency shall publish the resolution of intention in the same manner that notice for the hearing held under Section 10753.2 was published.
(b) Upon written request, the local agency shall provide any interested person with a copy of the resolution of intention.

10753.4. (a) The local agency shall prepare a groundwater management plan within two years of the date of the adoption of the resolution of intention. (1) If the plan is not adopted within two years, the resolution of intention expires, and a plan shall not be adopted except pursuant to a new resolution of intention adopted in accordance with this chapter. (2) If the plan is not adopted within two years, and the local agency was operating under a previously adopted groundwater management plan, that previous plan shall remain in effect.
(b) For the purposes of carrying out this part, the local agency shall make available to the public and the department a written statement describing the manner in which interested parties may participate in

developing the groundwater management plan. The local agency may appoint, and consult with, a technical advisory committee consisting of interested parties for the purposes of carrying out this part.
(c) The local agency shall establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements, and availability of draft plans, maps, and other relevant documents. Any person may request, in writing, to be placed on the list of interested persons.

10753.5. (a) After a groundwater management plan is prepared, the local agency shall hold a second hearing to determine whether to adopt the plan. Notice of the hearing shall be given pursuant to Section 6066 of the Government Code. Notice shall also be provided to the department and to all persons on the list established and maintained pursuant to subdivision (c) of Section 10753.4. The notice shall include a summary of the plan and shall state that copies of the plan and any maps that may be prepared pursuant to this part may be obtained for the cost of reproduction at the office of the local agency.
(b) At the second hearing, the local agency shall consider protests to the adoption of the plan. At any time prior to the conclusion of the second hearing, any landowner within the local agency may file a written protest or withdraw a protest previously filed.

10753.6. (a) A written protest filed by a landowner shall include the landowner's signature and a description of the land owned sufficient to identify the land. A public agency owning land is deemed to be a landowner for the purpose of making a written protest.
(b) The secretary of the local agency shall compare the names and property descriptions on the protest against the property ownership records of the county assessors.
(c) (1) A majority protest shall be determined to exist if the governing board of the local agency finds that the protests filed and not withdrawn prior to the conclusion of the second hearing represent more than 50 percent of the assessed value of the land within the local agency subject to groundwater management pursuant to this part. (2) If the local agency determines that a majority protest exists, the groundwater plan may not be adopted and the local agency shall not consider adopting a plan for the area proposed to be included within the program for a period of one year after the date of the second hearing. (3) If a majority protest has not been filed, the local agency, within 35 days after the conclusion of the second hearing, may adopt the groundwater management plan.

10753.7.
(a) For the purposes of qualifying as a groundwater management plan under this section, a plan shall contain the components that are set forth in this section. In addition to the requirements of a specific funding program, a local agency seeking state funds administered by the department for groundwater projects or groundwater quality projects, including projects that are part of an integrated regional water management program or plan, and excluding programs that are funded under Part 2.78 (commencing with Section 10795), shall do all of the following:
(1) Prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan. The plan shall include components relating to the monitoring and management of groundwater levels within the groundwater basin, groundwater quality degradation, inelastic land surface

subsidence, changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin, and a description of how recharge areas identified in the plan substantially contribute to the replenishment of the groundwater basin.
(2) For purposes of implementing paragraph (1), the local agency shall prepare a plan to involve other agencies that enables the local agency to work cooperatively with other public entities whose service area or boundary overlies the groundwater basin.
(3) For purposes of implementing paragraph (1), the local agency shall prepare a map that details the area of the groundwater basin, as defined in the department's Bulletin No. 118, and the area of the local agency, that will be subject to the plan, as well as the boundaries of other local agencies that overlie the basin in which the agency is developing a groundwater management plan.
(4) (A) Commencing January 1, 2013, for purposes of implementing paragraph (1), the groundwater management plan shall include a map identifying the recharge areas for the groundwater basin.
(B) The local agency shall provide the map required pursuant to subparagraph (A) to the appropriate local planning agencies after adoption of the groundwater management plan.
(C) Upon submitting a map pursuant to subparagraph (B), the local agency shall notify the department and all persons on the list established and maintained pursuant to subdivision (c) of Section 10753.4.
(D) For purposes of this paragraph, "map identifying the recharge areas" means a map that identifies, or maps that identify, the current recharge areas that substantially contribute to the replenishment of the groundwater basin.
(5) The local agency shall adopt monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin. The monitoring protocols shall be designed to generate information that promotes efficient and effective groundwater management.
(6) Local agencies that are located in areas outside the groundwater basins delineated on the latest edition of the department' s groundwater basin and subbasin map shall prepare groundwater management plans incorporating the components in this subdivision, and shall use geologic and hydrologic principles appropriate to those areas.
(b) (1) (A) A local agency may receive state funds administered by the department for groundwater projects or for other projects that directly affect groundwater levels or quality if it prepares and implements, participates in, or consents to be subject to, a groundwater management plan, a basinwide management plan, or other integrated regional water management program or plan that meets, or is in the process of meeting, the requirements of subdivision (a). A local agency with an existing groundwater management plan that meets the requirements of subdivision (a), or a local agency that completes an update of its plan to meet the requirements of subdivision (a) within one year of applying for funds, shall be given priority consideration for state funds administered by the department over local agencies that are in the process of developing a groundwater management plan. The department shall withhold funds from the project until the update of the groundwater management plan is complete.

(B) Notwithstanding subparagraph (A), a local agency that manages groundwater under any other provision of existing law that meets the requirements of subdivision (a), or that completes an update of its plan to meet the requirements of subdivision (a) within one year of applying for funding, shall be eligible for funding administered by the department. The department shall withhold funds from a project until the update of the groundwater management plan is complete.
(C) Notwithstanding subparagraph (A), a local agency that conforms to the requirements of an adjudication of water rights in the groundwater basin is in compliance with subdivision (a). For purposes of this subparagraph, an "adjudication" includes an adjudication under Section 2101, an administrative adjudication, and an adjudication in state or federal court.
(D) Subparagraphs (A) and (B) do not apply to proposals for funding under Part 2.78 (commencing with Section 10795), or to funds authorized or appropriated prior to September 1, 2002.
(E) A local agency may request state funds to map groundwater recharge areas pursuant to paragraph (4) of subdivision (a) to the extent that the request for state funds is consistent with eligibility requirements that are applicable to the use of the requested funds. (2) Upon the adoption of a groundwater management plan in accordance with this part, the local agency shall submit a copy of the plan to the department, in an electronic format, if practicable, approved by the department. The department shall make available to the public copies of the plan received pursuant to this part.

10753.8. A groundwater management plan may include components relating to all of the following:
(a) The control of saline water intrusion.
(b) Identification and management of wellhead protection areas and recharge areas.
(c) Regulation of the migration of contaminated groundwater.
(d) The administration of a well abandonment and well destruction program.
(e) Mitigation of conditions of overdraft.
(f) Replenishment of groundwater extracted by water producers.
(g) Monitoring of groundwater levels and storage.
(h) Facilitating conjunctive use operations.
(i) Identification of well construction policies.
(j) The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.
(k) The development of relationships with state and federal regulatory agencies.
(l) The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

10753.9. (a) A local agency shall adopt rules and regulations to implement and enforce a groundwater management plan adopted pursuant to this part.
(b) Nothing in this part shall be construed as authorizing the local agency to make a binding determination of the water rights of any person or entity.
(c) Nothing in this part shall be construed as authorizing the local agency to limit or suspend extractions unless the local agency has determined through study and investigation that groundwater replenishment programs or other alternative sources of water supply

have proved insufficient or infeasible to lessen the demand for groundwater.

10753.10. In adopting rules and regulations pursuant to Section 10753.9, the local agency shall consider the potential impact of those rules and regulations on business activities, including agricultural operations, and to the extent practicable and consistent with the protection of the groundwater resources, minimize any adverse impacts on those business activities.

10753.11. A plan shall not be considered invalid, and the local agency shall not be required to recirculate the plan for public comment or to delay implementation of the plan, if the local agency substantially complies with the public notice provisions of this chapter.

10754. For purposes of groundwater management, a local agency that adopts a groundwater management plan pursuant to this part has the authority of a water replenishment district pursuant to Part 4 (commencing with Section 60220) of Division 18 and may fix and collect fees and assessments for groundwater management in accordance with Part 6 (commencing with Section 60300) of Division 18.

10754.2. (a) Subject to Section 10754.3, except as specified in subdivision (b), a local agency that adopts a groundwater management plan pursuant to this part, may impose equitable annual fees and assessments for groundwater management based on the amount of groundwater extracted from the groundwater basin within the area included in the groundwater management plan to pay for costs incurred by the local agency for groundwater management, including, but not limited to, the costs associated with the acquisition of replenishment water, administrative and operating costs, and costs of construction of capital facilities necessary to implement the groundwater management plan.
(b) The local agency may not impose fees or assessments on the extraction and replacement of groundwater pursuant to a groundwater remediation program required by other provisions of law or a groundwater storage contract with the local agency.

10754.3. Before a local agency may levy a water management assessment pursuant to Section 10754.2 or otherwise fix and collect fees for the replenishment or extraction of groundwater pursuant to this part, the local agency shall hold an election on the proposition of whether or not the local agency shall be authorized to levy a groundwater management assessment or fix and collect fees for the replenishment or extraction of groundwater. The local agency shall be so authorized if a majority of the votes cast at the election is in favor of the proposition. The election shall be conducted in the manner prescribed by the laws applicable to the local agency or, if there are no laws so applicable, then as prescribed by laws relating to local elections. The election shall be conducted only within the portion of the jurisdiction of the local agency subject to groundwater management pursuant to this part.

10755. (a) If a local agency annexes land subject to a groundwater management plan adopted pursuant to this part, the local agency annexing the land shall comply with the groundwater management plan for the annexed property.
(b) If a local agency subject to a groundwater management plan adopted pursuant to this part annexes land not subject to a groundwater management plan adopted pursuant to this part at the time of annexation, the annexed territory shall be subject to the groundwater management plan of the local agency annexing the land.

10755.2. (a) It is the intent of the Legislature to encourage local agencies, within the same groundwater basin, that are authorized to adopt groundwater management plans pursuant to this part, to adopt and implement a coordinated groundwater management plan.
(b) For the purpose of adopting and implementing a coordinated groundwater management program pursuant to this part, a local agency may enter into a joint powers agreement pursuant to Chapter 5 (commencing with Section 6500) of Division 7 of Title 1 of the Government Code with public agencies, or a memorandum of understanding with public or private entities providing water service.
(c) A local agency may enter into agreements with public entities or private parties for the purpose of implementing a coordinated groundwater management plan.

10755.3. Local agencies within the same groundwater basin that conduct groundwater management programs within that basin pursuant to this part, and cities and counties that either manage groundwater pursuant to this part or have ordinances relating to groundwater within that basin, shall, at least annually, meet to coordinate those programs.

10755.4. Except in those groundwater basins that are subject to critical conditions of groundwater overdraft, as identified in the department's Bulletin 118-80, revised on December 24, 1982, the requirements of a groundwater management plan that is implemented pursuant to this part do not apply to the extraction of groundwater by means of a groundwater extraction facility that is used to provide water for domestic purposes to a single-unit residence and, if applicable, any dwelling unit authorized to be constructed pursuant to Section 65852.1 or 65852.2 of the Government Code.

10795. This part shall be known and may be cited as the Local Groundwater Management Assistance Act of 2000.

10795.2. There is hereby created the Local Groundwater Assistance Fund which shall be administered by the department.

10795.4. Upon appropriation by the Legislature, the money in the fund may be used by the department to assist local public agencies by awarding grants to those agencies to conduct groundwater studies or to carry out groundwater monitoring and management activities in accordance with Part 2.75 (commencing with Section 10750) or other authority pursuant to which local public agencies manage groundwater resources, or both, including the development of groundwater management plans, as provided for in subdivision (a) of Section 10753.7.

10795.6. The department, in making grants pursuant to this part, shall do both of the following:
(a) Award grants based on the recommendations submitted by the Technical Advisory Panel. The panel shall give priority to a local public agency that has adopted a groundwater management plan and submitted an application that demonstrates collaboration by that local public agency with other local public agencies with regard to the management of the affected groundwater basin.
(b) Ensure that the money in the fund is allocated in a geographically balanced manner among the regions of the state that are capable of, and interested in, implementing groundwater management programs.

10795.8. The department may enter into contracts and may adopt regulations subject to the advice and review of the Technical Advisory Panel, to carry out this part. Any grant contract entered into pursuant to this part may include provisions that the department determines are necessary.

10795.10. An application for a grant under this part shall be made to the department in the form and with the supporting materials prescribed by the department.

10795.12. (a) A Technical Advisory Panel shall review applications for grants based on criteria developed by the panel.
(b) The Technical Advisory Panel shall review applications and indicate whether, in its opinion, an application should be given priority pursuant to subdivisions (a) and (b) of Section 10795.6, and may place conditions on its recommendation for the funding of a specific project. These conditions may include requirements for additional clarification or further explanation of certain aspects of the project.

10795.14. (a) The Technical Advisory Panel shall be comprised of individuals appointed by the Secretary of the Resources Agency.
(b) (1) Panelists shall have background experience, or general knowledge, in the area of groundwater resources. (2) Panelists shall include all of the following:
(A) At least three individuals who currently serve on the board of directors of a local public agency that has adopted a groundwater management plan.
(B) A licensed civil engineer.
(C) A licensed geologist.
(D) A licensed hydrogeologist.
(E) At least one individual representing each of the hydrologic study areas shown in Figure 3 of the department's Bulletin 118-80, entitled "Ground Water Basins in California: A Report to the Legislature in Response to Water Code Section 12924."
(c) The number of individuals serving on the Technical Advisory Panel shall be determined by the Secretary of the Resources Agency.

10795.16. (a) If a member of the Technical Advisory Panel, or a member of his or her immediate family, is employed by a grant applicant , the employer of a grant applicant, or a consultant or independent contractor employed by a grant applicant, the panel member shall make that disclosure to the other members of the panel and shall not participate in the review of the grant application of that applicant.
(b) The Technical Advisory Panel shall operate on principles of collaboration. Panelists shall be appointed who are committed to working together with other interests for the long-term benefit of

California groundwater resources and the people who rely on those resources.
(c) Panelists shall be residents of the state and have an interest in the preservation, protection, and enhancement of the state's groundwater resources.
(d) Panelists shall not be employees of any state or federal agency.

10795.19. A local public agency receiving a grant under this part shall submit to the department copies of all data collected pursuant to the grant.

10795.20. Federal funds may be used for the purposes of this part.

APPENDIX B

News Paper Notices

Notice of Intent to Prepare Groundwater Management Plan

Notice of Intent to Adopt Groundwater Management Plan

APPENDIX C

Basin Advisory Panel Members, Charter and Governance Proposal

Basin Advisory Panel Members

Santa Rosa Plain Groundwater Management Planning

Basin Advisory Panel

Updated: 6/18/2014

Water Supply & Groundwater Technical Issues

- Mark Calhoon, Fircrest Mutual Water Company
- Jay Jasperse, Sonoma County Water Agency
- Gary Mickelson, California Groundwater Association
- Margaret DiGenova, Cal American Water Company

Groundwater Users, including Rural Residential Well Owners[i]

- Elizabeth Cargay, Well Owner & Foothills of Windsor Homeowners Association
- Edward Grossi, Sweet Lane Wholesale Nursery

Agriculture

- Keith Abeles, Community Alliance of Family Farmers
- Melissa Lema, Western United Dairymen's Association
- Tito Sasaki, Sonoma County Farm Bureau
- Robert Weinstock (alternate John Nagle), EJ Gallo, Representing the Sonoma County Winegrape Commission

Business / Developers

- Joe Gaffney, Sonoma County Alliance
- Curt Nichols, Carlile Macy Landscape Architects and Civil Engineers, for the Construction Coalition
- Daniel Sanchez, North Bay Association of Realtors

Environmental

- Rue Furch, Sebastopol Water Information Group (SWIG) and Sierra Club
- Jane Nielson, Sonoma County Water Coalition and O.W.L. Foundation

Governmental

- Bill Keene, Sonoma County Agricultural Preservation & Open Space District
- Pete Parkinson (retired), County of Sonoma
- Rocky Vogler (alternate Jennifer Burke), City of Santa Rosa
- Garrett Broughton (alternate Toni Bertolero), Town of Windsor
- John McArthur, City of Rohnert Park
- Sue Kelly, City of Sebastopol
- Damien O'Bid, City of Cotati
- Maureen Geary, Federated Indians of Graton Rancheria

Natural Resource Management

- John Guardino, Laguna de Santa Rosa Foundation
- Kara Heckert (alternate Valerie Minton), Sonoma Resource Conservation District

General Public

- Michael Burns, Resident Santa Rosa
- Dawna Gallagher, Well Owner & Clean Water Sonoma Marin
- Lloyd Iversen, Local Well Owner

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[i] About half of the Basin Advisory Panel members rely on a residential well at their homes.

Charter

Santa Rosa Plain Groundwater Management Planning

Basin Advisory Panel
Charter

Revisions Approved 4/2013

Purpose and Goals

The purpose of the Basin Advisory Panel is to develop a Groundwater Management Plan for the Santa Rosa Plain. The Panel will recommend the plan for implementing organizations to adopt. To this end, the goals of the group are to:

- Work collaboratively with other Panel members who represent groundwater users and interests from throughout the entire Santa Rosa Plain watershed.
- Develop common understanding on current and future water needs and resources in the Santa Rosa Plain.
- Support development of basin management objectives to protect resources in a sustainable manner, ensure local control, address current and future local water needs, and support the economy and environment.
- Negotiate in good faith to achieve consensus on how Santa Rosa Plain groundwater will be managed into the future.

Membership

The Basin Advisory Panel consists of members that represent the following interest groups:

- Groundwater users: businesses, agriculture and residential
- Economic interests
- Local government
- Water providers
- Environmental and community organizations

Members live throughout the Laguna de Santa Rosa watershed or work in agencies that have jurisdiction in the Santa Rosa Plain.

Additional stakeholders may join the Basin Advisory Panel after its initial formation with the concurrence of other Panel members using its decision-making process. If an interest group is already represented, interested stakeholders will be encouraged to participate by communicating with existing Panel members to represent his or her interests. Member organizations may change their individual representatives if necessary by notifying the project manager or facilitator.

Annual Membership Review

After completing the plan, the Panel will review its membership each fall to confirm members wish to continue serving and appropriate composition, revising the Basin Advisory Panel membership list as appropriate.

The Panel will determine whether new members are needed and will work with member organizations to identify representatives or help find a replacement that can regularly attend Panel meetings to represent the interest group. The Panel will consider the following criteria for determining new membership:

- Ensure balanced representation of interest groups and geographic areas in the Laguna de Santa Rosa Watershed
- Minimize gaps in technical expertise or professional experience
- Maintain manageable group size and composition for effective and efficient deliberations and decision making

Stakeholder Structure

The primary decision-making body is the Basin Advisory Panel. The Panel will guide development of the Groundwater Management Plan with assistance from a technical consultant, facilitator, and project manager.

Roles and Responsibilities

Basin Advisory Panel

The Basin Advisory Panel will work in partnership with the Sonoma County Water Agency and its cooperating partners to develop a non-regulatory groundwater management plan. The Basin Advisory Panel will guide development of the plan, which the technical consultants will write. The panel has a collaborative governance structure: agencies with jurisdiction within the Santa Rosa Plain will join community organizations, business associations, and individuals to develop the Groundwater Management Plan. After approving the completed Groundwater Management Plan, the Panel will recommend the plan for adoption by the boards of implementing organizations.

As part of membership, **Panel members** agree to:

- Arrive at each meeting fully prepared to discuss the issues on the agenda. Preparation would include reviewing meeting summaries, technical information, and draft documents distributed in advance of each meeting.
- Present their constituent members' views on the issues being discussed and be willing to engage in respectful, constructive dialogue with other members of the working group.
- Develop a problem-solving approach in which they consider the interests and viewpoints of all group members, in addition to their own.

- Keep their constituencies informed about the deliberations and actively seek their constituents' input.

Convener
The Sonoma County Water Agency is convening the Basin Advisory Panel. The convener will sponsor Panel meetings, garner necessary funding to complete the groundwater management plan, and provide in-kind staff support to manage the project. In addition, the convener has signed a Memorandum of Understanding with the California Department of Water Resources to secure facilitation services with the Center for Collaborative Policy and entered into a contract with the technical consultant Parker Groundwater to write the plan and perform technical analyses.

Lead Agency
The Panel will select a *lead agency* as required by Assembly Bill 3030 for developing non-regulatory groundwater management plans. The lead agency will also coordinate, as appropriate, with the cooperating funders, over the life of the project to ensure continued support and involvement in developing the Groundwater Management Plan.

Cooperating Funders
The Sonoma County Water Agency has formed a cooperative partnership with the Cities of Santa Rosa, Cotati, Rohnert Park and Sebastopol, the Town of Windsor, Cal American Water Company, and the County of Sonoma for the cooperative funding agreement to support developing the Santa Rosa Plain Groundwater Management Plan. The cooperating funders will provide in-kind staff participation in the Basin Advisory Panel. Once approved by the Panel, the cooperating funders will consider adopting the Groundwater Management Plan.

Technical Advisory Committee or Other Subcommittees
The Basin Advisory Panel will form a Technical Advisory Committee and can form other subcommittees or work groups to assist with its work of developing the groundwater management plan. Subcommittee composition should be representative of diverse groundwater interests. Members of the subcommittee or work group need not be members of the Basin Advisory Panel. The subcommittees would develop recommendations or proposals for the full stakeholder group's consideration.

Project Manager
The Sonoma County Water Agency will provide a project manager for the Basin Advisory Panel and groundwater management plan. The project manager will interface with the technical consultant and facilitator to ensure that meetings are efficient and work is completed in a timely fashion. The

project manager will ensure quality control of the plan and assist in making sure that the plan reflects stakeholder agreement. S/he will also work with stakeholders to negotiate agreements to be included in the plan. Finally, the project manager will facilitate public and media outreach for the Basin Advisory Panel. The current project manager is Marcus Trotta. The Sonoma County Water Agency has the discretion to change project managers.

Technical Consultant

The technical consultant has a contract with the Sonoma County Water Agency to write the groundwater management plan and perform related technical analyses. The technical consultant will attend Basin Advisory Panel meetings, present information necessary for Panel members to be able to contribute to the plan, and strive to balance stakeholder input with sound technical judgment.

Facilitator

In cooperation with all stakeholders, the facilitator from the Center for Collaborative Policy will design Panel meetings and guide the overall process toward achieving its mutually agreed-upon purpose and goals. The facilitator will:

- Formulate the agenda and desired outcomes for all meetings based on input of stakeholders and facilitate those proceedings.
- Identify and synthesize points of agreement and disagreement for written meeting summaries.
- Assist in building consensus among members.
- Ensure compliance with all ground rules.
- Serve as a confidential communication channel for members, alternates, and observers who wish to express views privately because they do not feel comfortable doing so in front of the large group.
- Advocate for a fair, effective, and credible process, but remain impartial with respect to the outcome of the deliberations.

California Department of Water Resources

The Department of Water Resources is available to provide technical assistance and support, but will not participate in the decision making process on the groundwater management plan.

Work Plan Overview

The Basin Advisory Panel will work for 18-24 months to develop the groundwater management plan. The key tasks for the panel are listed below.

Timeframe	Basin Advisory Panel Key Tasks
Dec 2011— June 2012	Collaborative Governance and Group Charter Santa Rosa Plain Groundwater Technical Information Sharing Issue Identification Groundwater Management Goals and Basin Management Objectives
April 2012— February 2013	Communication & Outreach Plan Finalize Basin Management Objectives Monitoring and Data Collection Protocols
January 2013— November 2013	Briefing Materials Management Components Implementation Plan
November 2013	Final Groundwater Management Plan

Meeting Schedule

The Panel agrees to hold meetings on the **second Thursday** of each month and to meet occasionally at other times for workshops. Periodically, the Panel may need to hold a special meeting or change the date should the need arise.

Attendance

Given the volume of information to be considered, regular attendance by the member or his/her designated representative is essential. Designees must be identified in advance, fully briefed, and able to represent the member during decision-making. The Panel may elect to suspend a discussion or a decision if it determines that some particular impacted perspective is not represented at the meeting or that the discussion would benefit from input from a stakeholder group that is not available at the meeting.

Communication

Media and External Parties

Members are asked to speak only for their organization or themselves when asked by external parties, including the media, about the Basin Advisory

Panel's progress, unless there has been a formal adoption of a statement, concepts, or recommendations by the Basin Advisory Panel.

In the absence of Basin Advisory Panel agreed upon statement, concepts or recommendations on an issue(s), Panel members shall say:

> *My comments only reflect me as an individual, not the Basin Advisory Panel's and should be reported as such. My views do not represent the Basin Advisory Panel.*

Stakeholders can express their own opinions to media representatives and will refer media representatives directly to other Panel members rather than attempting to speak on anyone's behalf. Participants should be careful to present only their own views and not those of other participants of the stakeholder group. The temptation to discuss someone else's statements or position should be avoided.

Constituents and Decision Makers

Members are asked to keep constituents, including organizational staff and members, boards and directors, and elected officials, informed about the process and to bring constituent's views into the discussion. Members are strongly encouraged to provide or arrange presentations about the Panel's work wherever feasible to increase awareness. Staff will also be available to provide presentations of the Panel's work at meetings, conferences or other venues.

Meeting Summaries

The project manager and facilitator will provide meetings summaries following each Basin Advisory Panel meeting.

Public Engagement and Outreach

All Basin Advisory Panel meetings will be open to the public, and the public is welcome to participate in Panel conversations. The facilitator may limit public comment to a designated public comment period if necessary to assure the Panel can complete its work in a timely fashion.

Early in the process, the Panel will oversee development of a public outreach plan, which will guide activities related to public engagement and outreach.

Basin Advisory Panel Decision-Making

1) **Consensus as the Fundamental Principle**: The Panel shall strive for consensus (agreement among all participants) in all of its decision-making. Working toward consensus is a fundamental principle.

2) **Definition of "Consensus":** Consensus means that all group members either fully support or can live with the decision or overall plan and believe that their constituents can as well. In reaching consensus, some Panel members may strongly endorse a particular proposal while others may accept it as "workable." Others may be only able to "live with it." Still others may choose to "stand aside" by verbally noting a disagreement, yet allowing the group to reach a consensus without them. Any of these actions still constitutes consensus.

3) **Less than 100% Consensus Decision Making**: The Panel is consensus seeking but shall not limit itself to strict consensus if 100% agreement among all participants cannot be reached after all interests and options have been thoroughly identified, explored, and discussed.

   Less-than-consensus decision-making shall not be undertaken lightly. If the Basin Advisory Panel cannot come to 100% agreement, the Panel could set aside the issue while it continues to work on other issues and revisit the disagreement later in the process. The Panel could also form a subcommittee (with at least three interest groups) to develop a proposal for full group consideration. With support from the facilitator, the subcommittee would develop one or more proposals that attempt to address the interests of all the parties and present it to the Panel. The Panel would then do one of the following:
   - Refine the proposal to reach consensus as defined above.
   - Ask the subcommittee to keep working and report back to the Panel at a subsequent meeting.
   - Vote to bring an issue to closure and move forward per the voting protocols below.

   3a) Voting Protocols

   For voting, absentee members can vote by proxy via another member or by contacting the facilitator in advance of the meeting. The Panel currently has 32 members

   Step 1: Is the Panel ready to vote on this proposal?

   Any panel member or the facilitator can call a vote. If **75% or more of total Panel membership** votes yes (regardless of attendance at meeting that day) then the issue goes to Step 2. If the vote is not approved, the Panel must keep working on this issue or may chose to

leave it out of the plan. If fewer than 75% of members are able to vote that day in person or by proxy, then the vote would be deferred to a subsequent meeting.

Step 2: Does the Panel approve this proposal?

If the Panel **approves the proposal with 75% of total Panel membership,** then the proposal moves forward. The facilitator will document the "minority opinion" in the meeting summary, and members who vote against the proposal can also submit comments to attach to the meeting summary. If the vote is not approved, the Panel must keep working on the issue or may chose to leave it out of the plan. At the time of the vote, the Panel will announce a set period of time for the Step 2 vote to remain open for additional member voting (approximately 10 days) before finalizing the outcome.

4) **Decision Outcomes:** All reports and products of the Panel will reflect the outcome of stakeholder discussions. All agreements and negotiated outcomes will be reflected in the Groundwater Management Plan.

Working Together

The Panel will use the following agreements to establish a productive protocol for meetings and may modify them as appropriate.

Process Agreements

The Panel agrees to:

- Listen and openly discuss issues with others who hold diverse views.
- View disagreements as problems to be solved rather than battles to be won. When develop a solution, think about the interests of others.
- Identify proposals to resolve problems presented, and remain open to considering others' proposals.
- Refrain from ascribing motives or intentions to other participants.
- Respect the integrity and values of other participants.
- Address the issues and concerns of the participants.
- Stand by agreements made with the Basin Advisory Panel when speaking elsewhere.
- Negotiate in good faith. All participants agree to participate in decision making, to act in good faith in all aspects of this effort, and to communicate their interests in group meetings. Good faith also requires that parties not make commitments they do not intend to follow through with.
- Stand by agreements reached unless new information emerges or conditions change that require the Panel to reconsider.

The Panel need not consider proposals that are contrary to the group's purpose as stated in its charter.

Members can also **caucus** in their interest groups to ensure that the representatives fully understand the perspectives of interest group members and to test proposals and ideas under development and before bringing them to the full Panel.

Meeting Agreements
During the meetings, the Panel agrees to:

Use Common Conversational Courtesy

All Ideas and Points of View Have Value
All ideas have value in this setting. We are looking for innovative ideas. The goal is to achieve understanding. Simply listen, you do not have to agree. If you hear something you do not agree with or you think is "silly" or "wrong," please remember that the purpose of the forum is to share ideas.

Be Honest, Fair, and as Candid as Possible
Help others understand you and work to understand others.

Avoid Editorials
It will be tempting to analyze the motives of others or offer editorial comments. Please talk about YOUR ideas and thoughts. Avoid commenting on why you believe another participant thinks something.

Efficiency
People's time is precious; treat it with respect.

Think Innovatively and Welcome New Ideas
Creative thinking and problem solving are essential to success. "Climb out of the box" and attempt to think about the problem in a new way.

Invite Humor and Good Will

Be Comfortable
Please feel help yourself to refreshments or take personal breaks. If you have other needs please inform the facilitator.

Approving the Groundwater Management Plan

The Basin Advisory Panel will approve the Santa Rosa Groundwater Management Plan and recommend that the implementing organizations and agencies adopt the Plan. The Plan shall not go forward to the adopters until Panel members have approved the plan using its decision-making process outlined above.

Amendments to this Charter

The Basin Advisory Panel may use its decision-making procedure, identified above, to adopt changes to this Charter.

Governance Proposal

Santa Rosa Plain Groundwater Management Planning

Governance Proposal

Subcommittee modified on **9/26/2012**
Basin Advisory Panel Approved June 2012 (One Member Opposed – See Meeting Summary 6/7/2012)

Document Purpose

The purpose of this document is to propose a governance structure for implementing a Groundwater Management Plan for the Santa Rosa Plain under AB 3030[1]. The Santa Rosa Plain Groundwater Management Plan Basin Advisory Panel approved this proposal on June 7, 2012.

Legal Framework for the Groundwater Management Plan

The Santa Rosa Plain Groundwater Management Plan Basin Advisory Panel (Panel) came together to develop a voluntary, non-regulatory groundwater management plan. The Panel has selected to develop an AB 3030 Plan for the Santa Rosa Plain providing a comprehensive framework for managing groundwater developed through a collaborative process and enhancing funding opportunities. The legal framework for the groundwater management plan would be an "AB 3030" Plan with the governance structure for implementation consisting of a Lead Agency, Basin Advisory Panel, and Technical Advisory Committee. The governance structure for implementation would be consistent with the following.

Governance Structure for Plan Implementation

Lead Agency Role

The Sonoma County Water Agency, as the Lead Agency, has ultimate responsibility for Groundwater Management Plan implementation and funding, including studies, projects, and programs it directly or indirectly funds. The Lead Agency role is to:

- Adopt and implement the Groundwater Management Plan consistent with Panel consensus
- Participate in the Panel
- Sponsor the Panel by providing project support, coordination, and facilitation as needed
- Coordinate and garner funding to implement the Groundwater Management Plan
- Be accountable and responsible to implement the Groundwater Management Plan in accordance with the Water Code and to remain eligible for state funding
- Provide in-kind staff support via a project manager to support Plan implementation

[1] Groundwater Management Plan in compliance with the provisions of AB3030, SB 1938 and AB 359 and with Water Code Sections 10750-10755.4

- Contract with technical consultants as necessary to support implementation of the Plan
- Coordinate, as appropriate, with the cooperating funders to ensure continued support and involvement in implementing the Groundwater Management Plan
- Develop and adopt only in collaboration with and with the concurrence of the Panel proposed rules or regulations where necessary to achieve the objectives of the Groundwater Management Plan as provided by AB 3030
- Explore options for funding groundwater management activities. In exercising this role, the Water Agency would only propose fees and assessments if the Panel recommended and approved
- Amend the Groundwater Management Plan with the concurrence and recommendation of the Basin Advisory Panel

Basin Advisory Panel Role

The Basin Advisory Panel (Panel) develops the groundwater management plan ~~in collaboration with the lead agency~~ and guides its implementation and will remain in existence as long as the plan is being implemented. The Panel discusses, provides input, and develops consensus recommendations for all activities that move forward to implement the plan. The Panel has a collaborative governance structure: the lead agency and other agencies with jurisdiction within the Santa Rosa Plain will join with community organizations, business associations, and individuals to determine the best way to implement the Groundwater Management Plan. All activities associated with implementing the Plan would be subject to approval of the Panel consistent with its charter. Panel meetings would be open to the public. The Panel's proposed action ~~decisions~~ would be identified prior to a meeting in an agenda and recorded in the meeting summary, including Panel member attendance. Members would be responsible to attend in person or request that an alternate or Panel member represent his or her viewpoint in decision-making. The Panel would be responsible for recommending amendments to the Groundwater Management Plan for approval by the Lead Agency's governing board.

Basin Advisory Panel (Panel) Composition

Upon approval of the Santa Rosa Plain Groundwater Management Plan, the Panel will continue to provide guidance for its implementation and any amendment of the Plan. The Panel will continue to make decisions through the collaborative approach of the Plan with representatives from each of the identified stakeholder or interest groups. Each interest group will select their representative(s) for the Panel who must be able to commit to the working agreements in the Panel Charter regarding process and defined consensus decision-making. The Panel can modify its charter using its decision-making protocols. Panel members must either live or have jurisdiction in the Santa Rosa Plain watershed. Panel members would typically serve 2-year terms. Members could serve multiple terms. The Panel would formally revisit its membership each fall when planning its work plan for the following year. An effort would be made to avoid having all new members in any one year.

The exact continuing composition for implementation would be similar to the Panel during plan development. The Basin Advisory Panel would identify the panel composition by interest group, continuing to seek diversity of representation as part of plan development and prior to plan adoption. The Panel would be composed of representatives of the Lead Agency, General Public, Agricultural Groundwater Users, Business & Developers, Residential Groundwater Users, Government (Tribal, County and City), Environmental Organizations, Natural Resources Management Organizations, Water Suppliers, and Groundwater Technical Expertise.

Technical Advisory Committee (TAC) Role

The Panel will designate an ad-hoc Technical Advisory Committee (TAC) to work on specifics of implementation of the Plan goals and objectives; advise the Panel on technical matters; and to develop recommendations on general Plan implementation for the Panel's consideration. TAC participation is not limited to Panel members; others with groundwater or technical expertise can also participate. The TAC will assist the Panel on the following activities:

- Working with the technical consultant on Plan implementation,
- Reviewing technical data and analyses and/or recommending data analyses,
- Determining if data is adequate to address the basin management objectives, and
- Reviewing annual reports on Plan implementation.

APPENDIX D

Letters of Support and Endorsements for the Groundwater Management Plan

APPENDIX E

Approach for Estimating Rural Pumping Using Model

SUMMARY OF GROUNDWATER DEMAND ESTIMATES IN THE PLAN AREA

Introduction

Estimates of groundwater demands (pumping) between 1975 and 2010 were developed by the U.S. Geological Survey (USGS) for the Santa Rosa Plain Watershed (Plan Area) (Nishikawa, 2013 and Woolfenden and Nishikawa, 2014). The groundwater demands developed for the Plan Area were grouped into two main categories: (1) public supply pumping; and (2) rural pumping. Rural pumping was further subdivided into rural agricultural pumping and rural domestic pumping. The following sections summarize the USGS procedures and results of the groundwater demand estimates for these categories.

Public Supply Pumping

Groundwater demands for public supply pumping within the Plan Area consist of groundwater pumped for municipal supply by the Cities of Cotati, Rohnert Park, Santa Rosa and Sebastopol, Town of Windsor, California American Water Company and the Sonoma County Water Agency. Groundwater demands for public supply produced by these agencies is metered and reported to the California Department of Public Health (CDPH) and is sourced through approximately 70 municipal wells in the Plan Area, as shown in Figure D-1. The reported public supply groundwater demands ranged from 3,900 acre-feet per year (afy) to 10,000 afy, as shown in Figure A-2 and on average represented approximately 18% of the total pumping from the Plan Area between 1975 and 2010 (7,100 afy).

Rural Pumping

Groundwater demands for rural pumping include pumping for agricultural and rural domestic supply. As rural domestic and agricultural pumping are not commonly measured or reported, the USGS estimated these groundwater demands. The process for estimating groundwater demands for rural domestic and agricultural supplies is summarized below.

Rural Domestic Pumping

For the purposes of estimating rural pumping, it was assumed that residents of semi-rural and rural areas outside the municipal service areas of the Cities of Santa Rosa, Rohnert Park, Cotati, Sebastopol, California American Water Company and the Town of Windsor rely on groundwater for water supply. The rural domestic pumping was estimated by calculating the population located outside of the municipal service areas for the aforementioned agencies using census-tracts defined by the U.S. Census Bureau for 1970, 1980, 1990 and 2000. It was assumed that the 1970 census data represented the population for 1975, the 1980 census data represented the population from 1976 to 1985, the 1990 census data represented the population from 1986 to 1995, and the 2000 census data represented the population distribution from 1996 to 2010. It also was assumed that the municipal

service areas did not change during the periods between the census tabulation of population.

The population located outside municipal service areas was then multiplied by an annual per-capita water demand, assumed to equal 0.19 acre-ft per capita (California Department of Water Resources, 1994), to obtain the total annual rural domestic groundwater demands. The rural domestic groundwater demands were distributed within the fully-coupled hydrologic model for the Plan Area (GSFLOW), to over 3,000 wells[1] (included with rural wells on Figure D-1). The estimated rural domestic groundwater demands ranged from 12,100 afy to 23,400 afy, as shown in Figure D-2 and on average represented approximately 50% of the total pumping from the Plan Area between 1975 and 2010 (19,300 afy).

Agricultural Pumping

Agricultural pumping was initially estimated for water years 1975–2010 by using the decoupled precipitation-runoff modeling system (PRMS) watershed-component model and a daily crop water-demand model (CWDM), which incorporate land-use data and monthly crop coefficients. As further described below, the initial estimates of agricultural pumping were subsequently refined during the calibration of the fully-coupled hydrologic model for the Plan Area (GSFLOW) to develop final estimates of agricultural pumping.

Initial Agricultural Pumping Estimates

To develop the initial estimates of agricultural pumping for the Plan Area, watershed-component model (PRMS) simulations were used in conjunction with a daily crop water-demand model (CWDM) to estimate the unmet crop water demand. This unmet demand is equal to the crop demand after accounting for effective precipitation and recycled water application. Estimated agricultural irrigation demand for the Plan Area was inferred from areas of irrigated crop types identified in the California Department of Water Resources land-use surveys (California Department of Water Resources, 1974, 1979, 1986, 1999) and from crop types identified in unpublished data from Sonoma County Water Agency for 2008 (Sonoma County Water Agency, written communication, 2008). The CWDM was applied separately to five different simulation periods spanning water years 1975–2010; each period was associated with a unique land-use map that was representative of the crop distribution during that period. The most prevalent crop type and land use were assigned to each area; areas with mostly non-irrigated land uses or crop types were defined as non-irrigated areas.

The CWDM uses a root-zone water balance approach that assumes that the source of all water for crop transpiration is rainfall and irrigation. For simplification, transpiration of groundwater from the saturated zone was excluded from the

[1] The rural wells shown in Figure D-1 represent both rural domestic and agricultural wells and do not necessarily represent actual well locations, but are distributed spatially within cells of the hydrologic model to represent the distribution of rural pumping within the Plan Area.

CWDM and it was assumed that all of the unmet crop water demand (after rainfall and irrigation with recycled water) was met using groundwater. The CWDM accounts for deep percolation as well as ET from the soil profile in the calculation of the crop water demand.

For each simulation period, adjustments were made to the PRMS parameters to better represent the differences in vegetation types defined by the land-use period being simulated. The PRMS simulation provided daily inputs of potential evapotranspiration (PET), evapotranspiration (ET), and soil moisture to the CWDM. Additional inputs to the CWDM included the crop type and monthly crop coefficients for each crop type to represent factors such as growing season and crop water use. The crop coefficients in the CWDM were comparable to the crop coefficients commonly used in calculations of crop water-demand.

The initial agricultural demands simulated by the CWDM exhibited high seasonal variability and ranged from 7,000 afy to 43,000 afy. The annual simulated agricultural demands varied significantly in response to year to year climate conditions (i.e., higher agricultural demands were estimated for drier water years and lower agricultural demands were estimated for wetter years). The highest irrigation rates estimated by the CWDM were for pasture lands not receiving recycled water and ranged from 24 to 38 inches per year. Irrigation rates for vineyards generally ranged from 12 to 20 inches per year, but were as high as 31 to 38 inches per year in sandier well-drained soils. The CWDM did not account for some local practices which led to the model overestimating agricultural demands: (1) deficit irrigation practices commonly applied in winegrape growing; and (2) fallowing of fields during drought periods. Deficit irrigation consists of applying less water than the full potential plant requirement and is conducted to improve fruit quality and more common estimates of irrigation rates for vineyards within the Plan Area range from 4 to 8 inches per year. As described below, these initial agricultural demand estimates were reduced during calibration of the watershed model, which addresses the initial overestimate of agricultural irrigation.

Final Estimates of Agricultural Pumping

Final estimates for agricultural pumping were derived during the calibration of the fully-coupled hydrologic model for the Plan Area (GSFLOW). The initial agricultural pumping estimates were used as input to the GSFLOW model by distributing the demands to 1,072 agricultural wells[2] (included with rural wells on Figure D-1). During the process of calibrating the GSFLOW model, simulated groundwater levels were initially too low near agricultural wells compared with measure data indicating that the initial estimated agricultural demands were too high. Adjusting other model input parameters, including the hydraulic conductivity and storage

[2] The rural wells shown in Figure D-1 represent both rural domestic and agricultural wells and do not necessarily represent actual well locations, but are distributed spatially within cells of the hydrologic model to represent the distribution of rural pumping within the Plan Area.

properties did not improve the overall match between simulated and measured groundwater levels. Therefore, agricultural pumping demands within the model were reduced by as much as 33 percent from the initial values (starting in water year 1982), which resulted in improved calibration of the model. Figure D-3 shows a comparison of the initial and final estimates for rural groundwater pumping (comprised of both rural domestic and agricultural groundwater demands) within the Plan Area.

The resulting final estimated agricultural groundwater demands ranged from 4,900 afy to 21,400 afy, as shown in Figure D-2 and on average represented approximately 32% of the total pumping from the Plan Area between 1975 and 2010 (12,600 afy). Applying the final annual agricultural groundwater demands to the areas of irrigated agriculture for the various land use datasets results in irrigation rates that average approximately 9 inches per year for all agricultural crop types.

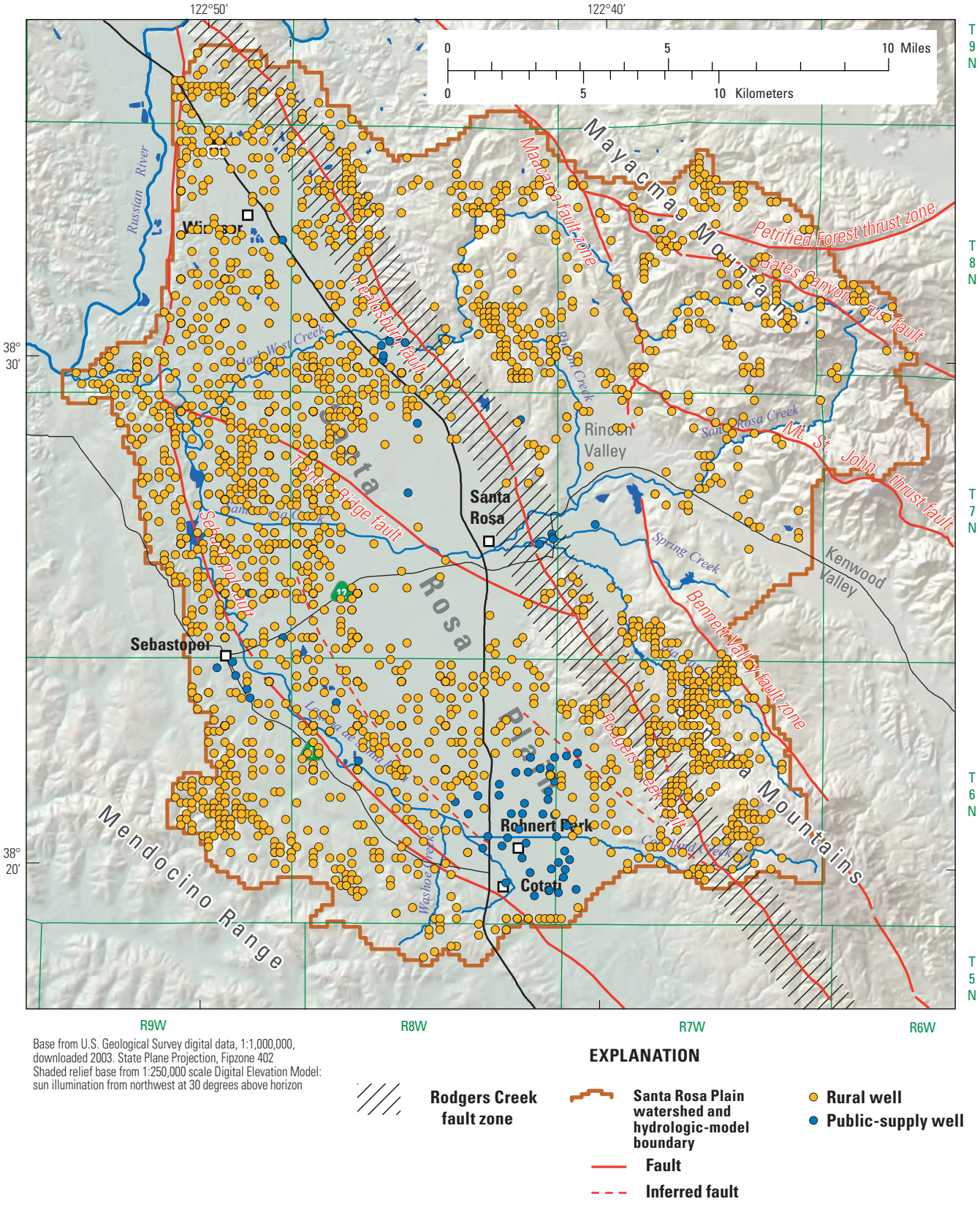
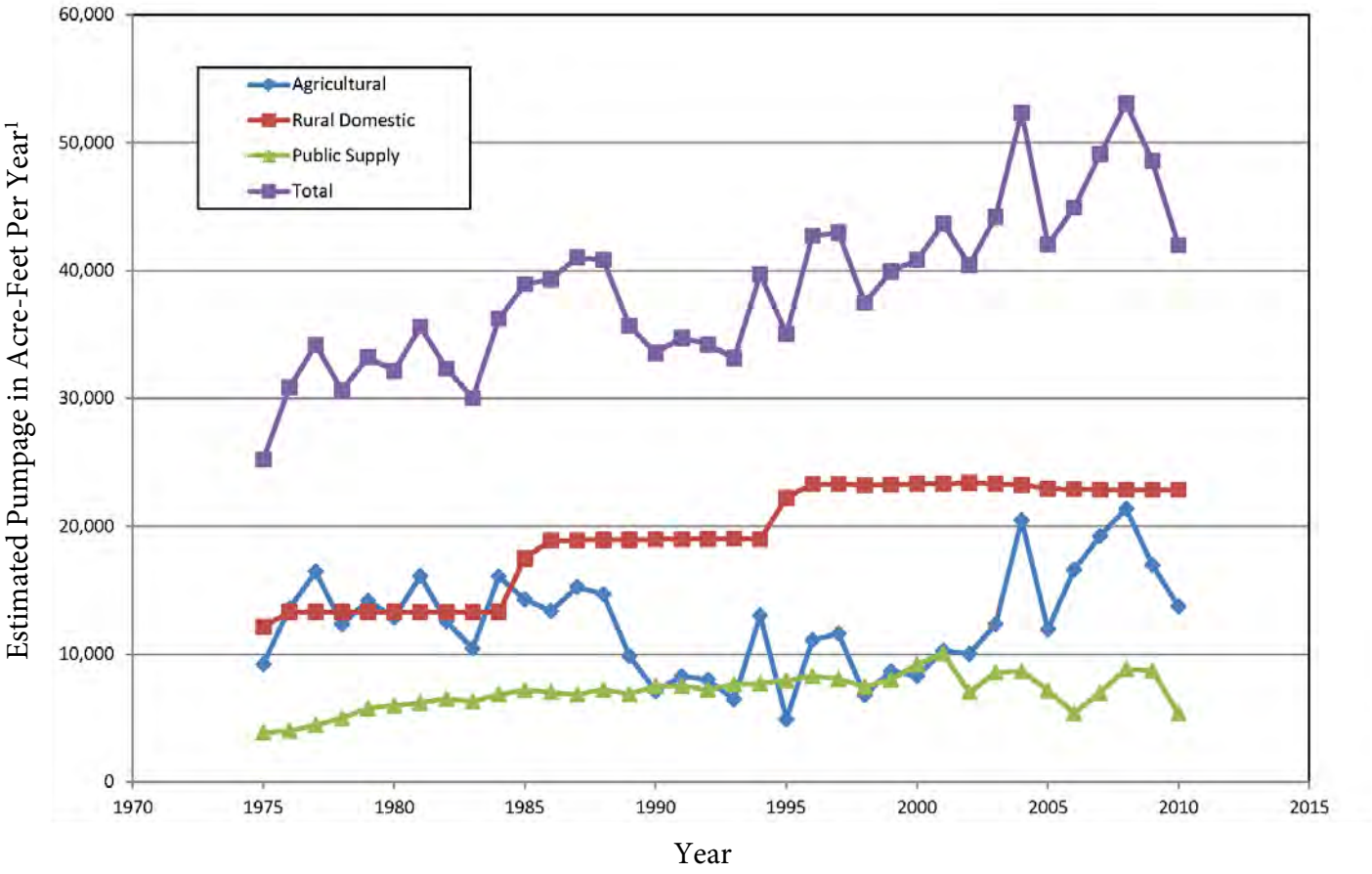
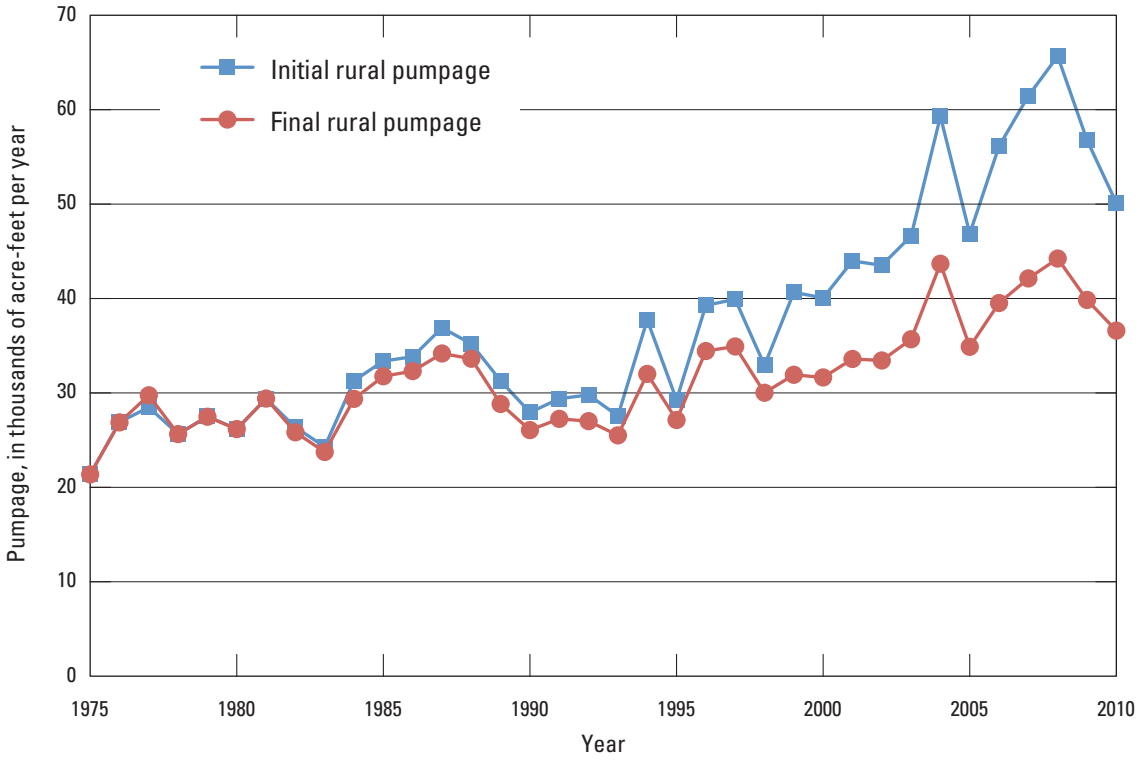


Figure 6. Public-supply and rural (agricultural and domestic) wells, Santa Rosa Plain watershed, Sonoma County, California.



[1]Estimated pumpage based on simulations from final calibrated GSFLOW Model for Santa Rosa Plain Watershed (USGS, 2014).

Total Estimated Average Annual Pumping in the Plan Area	Figure 2-16



sac13-0495_Figure D13_initial and final pumpage

APPENDIX F

Summary of Existing Groundwater-Level Monitoring Well Information

Table F-1. Summary of Existing Groundwater-Level Monitoring Wells
Santa Rosa Plain Watershed

SRP_ID	Well Type	Program	Well Depth Category
1	Private	CASGEM	<200
2	Private	CASGEM	<200
3	Private	CASGEM	<200
4	Private	CASGEM	200-500
5	Private	CASGEM	Unknown
6	Private	CASGEM	Unknown
7	Dedicated	CASGEM	Unknown
8	Dedicated	CASGEM	Unknown
9	Dedicated	CASGEM	<200
10	Dedicated	CASGEM	<200
11	Dedicated	CASGEM	<200
12	Dedicated	CASGEM	<200
13	Dedicated	CASGEM	<200
14	Dedicated	CASGEM	<200
15	Dedicated	CASGEM	<200
16	Dedicated	CASGEM	Unknown
17	Dedicated	CASGEM	Unknown
18	Dedicated	CASGEM	<200
19	Dedicated	CASGEM	<200
20	Dedicated	CASGEM	200-500
21	Dedicated	CASGEM	<200
22	Dedicated	CASGEM	<200
23	Dedicated	CASGEM	<200
24	Dedicated	CASGEM	<200
25	Dedicated	CASGEM	200-500
26	Dedicated	CASGEM	200-500
27	Dedicated	CASGEM	<200
28	Dedicated	CASGEM	Unknown
29	Dedicated	CASGEM	Unknown
30	Dedicated	CASGEM	Unknown
31	Inactive Municipal	CASGEM	Unknown
32	Inactive Municipal	CASGEM	>500
33	Inactive Municipal	CASGEM	200-500
34	Inactive Municipal	CASGEM	>500
35	Inactive Municipal	CASGEM	200-500
36	Inactive Municipal	CASGEM	Unknown
37	Private	DWR	Unknown
38	Private	DWR	Unknown
39	Private	DWR	<200
40	Private	DWR	<200

41	Private	DWR	<200
42	Private	DWR	<200
43	Private	DWR	>500
44	Private	DWR	<200
45	Private	DWR	<200
46	Private	DWR	200-500
47	Private	DWR	200-500
48	Private	DWR	<200
49	Private	DWR	<200
50	Private	DWR	200-500
51	Private	DWR	200-500
52	Private	DWR	<200
53	Private	DWR	200-500
54	Private	DWR	<200
55	Private	DWR	<200
56	Private	DWR	<200
57	Private	DWR	<200
58	Private	DWR	<200
59	Private	DWR	<200
60	Private	DWR	<200
61	Private	DWR	Unknown
62	Private	DWR	Unknown
63	Private	DWR	Unknown
64	Public Supply	PRMD	Unknown
65	Public Supply	PRMD	Unknown
66	Public Supply	PRMD	Unknown
67	Public Supply	PRMD	Unknown
68	Public Supply	PRMD	Unknown
69	Public Supply	PRMD	Unknown
70	Public Supply	PRMD	Unknown
71	Public Supply	PRMD	200-500
72	Public Supply	PRMD	200-500
73	Public Supply	PRMD	200-500

APPENDIX G

Monitoring Protocols

Standard Operating Procedure
Groundwater Level Data Collection

PROCEDURES FOR GROUNDWATER-LEVEL MEASUREMENTS
CALIFORNIA GROUNDWATER ELEVATION MONITORING PROGRAM
SELECT SONOMA COUNTY BASINS AND SUBBASINS

The purpose of these Procedures are to set guidelines for the determination of the depth to groundwater in wells incorporated into the California Statewide Groundwater Elevation Monitoring (CASGEM) program for which either the Sonoma County Water Agency or County of Sonoma Permit and Resource Management Department serve as the Monitoring Entity. The wells incorporated into the CASGEM program include a combination of private water-supply wells, inactive public water-supply wells, and dedicated monitoring wells (or piezometers). These standard operating procedures may be varied or changed as required, dependent on site conditions, and equipment limitations. In all instances, the actual procedures employed should be documented and described on the field form.

Data Gathering for New Well

1) General Information. General information, such as well site address, owner's contact information, clear notes regarding the location of the well (particularly for properties containing more than one well) should be recorded on a well information form and maintained in a project file.
2) GPS coordinates for latitude and longitude of well. Determine well owner's preference for reporting of latitude and longitude of the well location and select location for obtaining GPS coordinates. CASGEM Program requirements allow for the reported latitude and longitude to be within 1,000 feet of the actual well location. Utilize a hand-held GPS unit for recording the latitude and longitude referenced to the North American Datum of 1983.
3) Ground Surface Elevation. The ground surface elevation at the wellhead referenced to the North American Vertical Datum of 1983 will be obtained by either: (1) surveying to a benchmark; (2) using a USGS 7.5' topographic quadrangle map; or (3) using a digital elevation model. The location chosen for the vertical elevation should represent the average elevation of the ground around the wellhead.
4) Reference Point. The reference point is the point where groundwater-level measurements are recorded from and is typically either at the access plug on the well casing lid (for water supply wells) or at the top of the casing (for dedicated monitoring wells). A detailed description and/or photograph of the measurement reference point should be documented on a well information form.

Field Preparation

1) Determine the number of measurements needed, the methods to be employed, and the equipment and supplies needed.
2) Sanitize or pre-clean equipment, and ensure that it is in working order.
3) Coordinate schedule with well owners and staff, if appropriate. Arrange for a measurement time when the well is least likely to have been recently pumping.

4) If this is an initial visit, conduct a well information inventory, obtain well log and construction information if available, plan to identify and photograph measurement reference point, and measure distance from measurement reference point to ground surface.
5) Identify site information and documentation required and measurement locations.

Field Procedures

Procedures for measuring groundwater levels are as follows:

1) Ensure the pump is not currently operating. If the well is pumping either do not take a measurement and record QA/QC code 1 on the field form or contact well owner and have well shut off, if feasible, and take measurement after groundwater level has returned to static levels;
2) Remove well cap or plug, note well ID, time of day, and date on the groundwater level data form.
3) Place groundwater-level measuring device into the well.
4) For electrical tapes record the distance from the water surface, as determined by the audio signal or meter, to the reference measuring point and record. For sonic meter record the level displayed on the LED readout.
5) Wait for several minutes and repeat the measurement.
6) Repeat measurements consistently going up or down: if measurements are going up, ideally take measurements until the level stabilizes within 0.1 feet; otherwise note the measurements as questionable. If going down then note "questionable."
7) If known, note the time since the well was last pumping.
8) Remove all downhole equipment, and replace well plug or cap.
9) Clean and rinse all downhole equipment and store for transport to the next well.
10) Note any changes in the well condition since the previous measurement (e.g., new reference point, new well enclosure, etc.)

Quality Assurance/Quality Control

The following general quality assurance/quality control (QA/QC) procedures apply:

1) Document measurements, notes and QA/QC codes on the groundwater level data forms or field notebook.
2) Operate instruments in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified.
3) Each well should be tested at least twice in order to compare results. If results do not agree to within 0.1 feet, a third measurement should be taken and the readings averaged. Consistent failure of consecutive readings to agree suggests that levels are changing because of one or more conditions as indicated in Section 1, and should be noted on the field form.
4) Results should be compared to historical measurements while in the field and significant discrepancies noted and resolved, if possible.

5) Wells for which no measurements or questionable measurements are obtained should have the codes entered on the field form as follows:

No Measurement		**Questionable Measurement**	
0	Discontinued	**0**	Caved or deepened
1	Pumping	**1**	Pumping
2	Pumphouse locked	**2**	Nearby pump operating
3	Probe/tape hung up	**3**	Casing leaking or wet
4	Can't get probe/tape in casing	**4**	Pumped recently (if known, note time since pump shut off)
5	Unable to locate well	**5**	Air or pressure gauge measurement
6	Well destroyed	**6**	Other
7	Special	**7**	Recharge operation at or nearby well
8	Casing leaking or wet	**8**	Oil in casing
9	Temporarily inaccessible		
D	Dry well		
F	Flowing well		

6) Upon return from the field, appropriate corrective actions need to be communicated and completed prior to the next survey event.
7) All data entered into electronic spreadsheet or database should be double-keyed or hard copy printed and proofed by a second person.
8) Questionable wells or measurements noted during data compilation need to result in corrective actions, if applicable.

Sanitary Practices for Equipment

The water level measurement equipment should be handled carefully, both when transporting the equipment and when using the equipment to take water level measurements. In effect, only the water level measurement probe end should come in contact with the well water.

The water level measurement equipment should be kept and maintained clean by preventive and standard cleaning measures including:

- Placing the equipment in a clean space for storage and during transport to avoid contact with dirty surfaces
- At a minimum, cleaning the probe at the end of the tape with an appropriate cleaning agent at the beginning of field activities, whenever the probe appears dirty, and at the end of the measurement round
- Inspecting the probe tape carefully before and after each water measurement for any foreign materials.

In between each water level measurement, the probe should be carefully inspected. If the probe appears dirty at all or appears to have foreign material on it, the probe should be properly cleaned. If the probe appears clean, at a minimum the probe should be disinfected.

The sanitary practices outlined above should be considered as guidance only. Please note that this guidance only pertains to placing temporary water level monitoring equipment in a well.

Groundwater Level Data Form - CASGEM Program

Well Name	Well ID Number	County	Basin	Land Surface Datum Elevation (feet msl relative to NAVD88)	Method for Determining Land Surface Datum	Distance from Land Surface to Reference Point	Reference Point (RP) Elevation

NO MEASUREMENT (NM)

0. discontinued
1. pumping
2. pump house locked
3. tape hung up
4. can't insert tape
5. unable to locate
6. well destroyed
7. special
8. casing leaky/wet
9. temporarily no access

D. dry well
F. flowing well

QUESTIONABLE MEASUREMENT (QM)

0. caved/deepened
1. pumping
2. nearby pumping
3. casing leaky/wet
4. pumped recently
5. air/pressure measurement
6. other
7. recharge at/nearby
8. oil in casing

MEASUREMENT METHOD (MM)

0. steel tape
1. electrical sounding tape
2. sonic meter
3. other

Date	Time	MM	Depth to Water (feet)	Stable Measurement?	Comments	NM	QM

DPH Guidelines for Water Quality Sampling

COLLECTION, PRETREATMENT, STORAGE AND TRANSPORTATION OF WATER AND WASTEWATER SAMPLES

STATE OF CALIFORNIA

DEPARTMENT OF HEALTH SERVICES

DIVISION OF DRINKING WATER AND ENVIRONMENTAL MANAGEMENT

SANITATION AND RADIATION LABORATORIES BRANCH

NORTHERN AND SOUTHERN CALIFORNIA SECTIONS

May 1, 1995

OF CALIFORNIA—HEALTH AND WELFARE AGENCY

PETE WILSON, *Governor*

ARTMENT OF HEALTH SERVICES
ISION OF DRINKING WATER AND ENVIRONMENTAL MANAGEMENT
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May 1, 1995

This is the fifth edition of the manual for the "Collection, Pretreatment, Storage and Transportation of Water and Wastewater Samples", prepared by the California Department of Health Services.

The four prior editions (Navone, 1953; Greenberg, 1958; and Tamplin, 1971 and 1985) no longer reflect present practices and should be discarded. The current edition was necessitated by recent additions and changes to the Safe Drinking Water Act and Title 22, California Code of Regulations, and endeavors to reflect sampling requirements up to and including Phases II and V of the Safe Drinking Water Act.

Although sampling, container, preservative and transportation requirements are universally applicable, this manual specifically outlines these steps for samples taken for submittal to the Sanitation and Radiation Laboratories of the California Department of Health Services.

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TABLE OF CONTENTS

I. SAMPLING

Sampling or sample collection is the process of collecting a portion of the environmental medium (such as water) so that the amount collected is representative of the material being sampled. Not all aspects of sampling can be covered in their entirety here. However there are several documents available from standard setting agencies that deal with the subject in detail. Here we have excerpted some information that is central to this activity from *Standard Methods for the Examination of Water and Wastewater,* 18th edition, 1992.

A. Sampling Objective

"The objective of sampling is to collect a portion of material small enough in volume to be transported conveniently and handled in the laboratory while still accurately representing the material being sampled. This objective implies that the relative proportions or concentrations of all pertinent components will be the same in the samples as in the materials being sampled, and that the sample will be handled in such a way that no significant changes in composition occur before the tests are made.

"A sample may be presented to the laboratory for specific determinations with the collector taking responsibility for its validity. Often, in water and wastewater work, the laboratory conducts or prescribes the sampling program, which is determined in consultation with the user of the test results. Such consultation is essential to insure selecting samples and analytical methods that provide a true basis for answering the questions that prompted the sampling.

"The sampling program defines the portion of the whole to which the test results apply. Account must be taken of the variability of the whole with respect to time, area, depth, and in some cases, rate of flow.

B. General Precautions

"Obtain a sample that meets the requirements of the sampling program and handle it in such a way that it does not deteriorate or become contaminated before it reaches the laboratory. Before filling, rinse sample bottle out two or three times with the water being collected, unless the bottle contains a preservative or dechlorinating agent. Depending on determinations to be performed, fill container full (most organics determinations) or leave space for aeration, mixing, etc. (microbiological analyses). For samples that will be shipped, preferably leave an air space of about 1% of the container capacity to allow for thermal expansion.

"Sample carefully to insure that analytical results represent the actual sample composition. Important factors affecting results are the presence of suspended matter or turbidity, the method chosen for its removal, and the physical and chemical changes brought about by storage or aeration. Particular care is required when processing (grinding, blending, sieving, filtering) samples to be analyzed for trace constituents, especially metals and organic compounds. Some determinations, particularly of lead,

can be invalidated by contamination from such processing. Treat each sample individually with regard to the substances to be determined, the amount and nature of turbidity present, and other conditions that may influence the results.

"It is impractical to give directions covering all conditions, and the choice of technique for collecting a homogeneous sample must be left to the professional's judgment.

"Make a record of every sample collected and identify every bottle, preferably by attaching an appropriately inscribed tag or label. Record sufficient information to provide positive sample identification at a later date, including the name of the sample collector, the date, hour, and exact location, the water temperature, and any other data that may be needed for correlation, such as weather conditions, water level, stream flow, post-sampling handling, etc. Provide space on the label for the initials of those assuming sample custody and for the time and date of transfer. Fix sampling points by detailed description, by maps, or with the aid of stakes, buoys, or landmarks in a manner that will permit their identification by other persons without reliance on memory or personal guidance.

"Before collecting samples from distribution systems, flush lines sufficiently to insure that the sample is representative of the supply, taking into account the diameter and length of the pipe to be flushed and the velocity of flow.

"Collect samples from wells only after the well has been pumped sufficiently to insure that the sample represents the groundwater source. Sometimes it will be necessary to pump at a specified rate to achieve a characteristic drawdown, if this determines the zones from which the well is supplied. Record pumping rate and drawdown.

"When samples are collected from a river or stream, observed results may vary with depth, stream flow, and distance from shore and from one shore to the other. If equipment is available, take an "integrated" sample from top to bottom in the middle of the stream or from side to side at mid depth, in such a way that the sample is integrated according to flow. If only a grab or catch sample can be collected, take it in the middle of the stream and at mid-depth.

"Lakes and reservoirs are subject to considerable variations from normal causes such as seasonal stratification, rainfall, runoff, and wind. Choose location, depth, and frequency of sampling depending on local conditions and the purpose of the investigation. Avoid surface scum.

"Use only representative samples (or those conforming to a sampling program) for examination. The great variety of conditions under which collections must be made makes it impossible to prescribe a fixed procedure. In general, take into account tests or analyses to be made and the purpose for which the results are needed.

C. Types of Samples

Grab or catch samples:

"Strictly speaking, a sample collected at a particular time and place can represent only the composition of the source at that time and place. However, when a source is known to be fairly constant in composition over a considerable period of time or over substantial distances in all directions, then the sample may be said to represent a longer time period or a larger volume, or both, than the specified point at which it was collected. In such circumstances, some sources may be represented quite well by single grab samples.

"When a source is known to vary with time, grab samples collected at suitable intervals and analyzed separately can document the extent, frequency, and duration of these variations. Choose sampling intervals on the basis of the frequency with which changes may be expected, which may vary from as little as 5 minutes to as long as 1 hour or more.

"When the source composition varies in space rather than time, collect samples from appropriate locations.

"Use great care in sampling wastewater sludges, sludge banks, and muds. No definite procedure can be given, but take every possible precaution to obtain a representative sample or one conforming to a sampling program.

Composite samples:

"In most cases, the term "composite sample" refers to a mixture of grab samples collected at the same sampling point at different times. Sometimes the term "time-composite" is used to distinguish this type of sample from others. Time-composite samples are most useful for observing average calculations that will be used, for example, in calculating the loading or the efficiency of a wastewater treatment plant. As an alternative to the separate analysis of a large number of samples, followed by computation of average and total results, composite samples represent a substantial saving in laboratory effort and expense.

"To evaluate the effects of special, variable, or irregular discharges and operations, collect composite samples representing the period during which such discharges occur.

"For determining components or characteristics subject to significant and unavoidable changes on storage, do not use composite samples. Make such determinations on individual samples as soon as possible after collection and preferably at the sampling point. Use time-composite samples only for determining components that can be demonstrated to remain unchanged under the conditions of sample collection and preservation.

"If preservatives are used, add them to the sample bottle initially so that all portions of the composite are preserved as soon as collected. Analysis of individual samples sometimes may be necessary.

"It is desirable, and often essential, to combine individual samples in volumes proportional to flow. A final sample volume of 2 to 3 L is sufficient for sewage, effluents, and wastes.

"Automatic sampling devices are available; however, do not use them unless the sample is preserved as described below. Clean sampling devices, including bottles, daily to eliminate biological growths and other deposits.

Integrated samples:

"For certain purposes, the information needed is provided best by analyzing mixtures of grab samples collected from different points simultaneously, or as nearly so as possible. Such mixtures sometimes are called integrated samples. An example of the need for such sampling occurs in a river or stream that varies in composition across its width and depth. To evaluate average composition or total loading, use a mixture of samples representing various points in the cross-section, in proportion to their relative flows.

"Both natural and artificial lakes show variations of composition with both depth and horizontal location. However, under many conditions, neither total nor average results are especially significant, local variations are more important. In such cases, examine samples separately rather than integrate them.

"Preparation of integrated samples usually requires special equipment to collect a sample from a known depth without contaminating it with overlying water. Knowledge of the volume, movement, and composition of the various parts of the water being sampled usually is required. Therefore, collecting integrated samples is a complicated and specialized process that cannot be described in detail.

D. Methods of Sampling

Manual sampling:

"Manual sampling involves no equipment but may be unduly costly and time-consuming for routine or large-scale sampling programs.

Automatic sampling:

"Automatic samplers are being used increasingly. They are effective and reliable and can increase significantly the frequency of sampling. Various devices are available but no one sampler is universally ideal. Consult manufacturer's specifications to select the sampler best suited to the need.

E. Quantity

"Collect a 2-L sample for most physical and chemical analyses. For certain determinations, larger samples may be necessary. Do not use the same sample for chemical, (organic and inorganic) bacteriological, and microscopic examinations because methods of collecting and handling are different.

F. Preservation

"Complete and unequivocal preservation of samples, whether domestic wastewater, industrial wastes, or natural waters, is a practical impossibility. Regardless of the sample nature, complete stability for every constituent can never be achieved. At best, preservation techniques only retard chemical and biological changes that inevitably continue after sample collection.

Nature of Sample Changes:

"Some determinations are more likely than others to be affected by sample storage before analysis. Certain cations are subject to loss by adsorption on, or ion exchange with, the walls of glass containers.

"Temperature changes quickly; pH may change significantly, in a matter of minutes dissolved gases (oxygen, carbon dioxide) may be lost. Determine temperature, pH, and dissolved gases in the field.

"Iron and manganese are readily soluble in their lower oxidation states but relatively insoluble in their higher oxidation states; therefore, these cations may precipitate out or they may dissolve from a sediment, depending upon the redox potential of the sample. Microbiological activity may be responsible for changes in the nitrate-nitrite-ammonia content, for decreases in phenol concentration and BOD, or for reducing sulfate to sulfide. Residual chlorine is reduced to chloride. Sulfide, sulfite, ferrous iron, iodine, and cyanide may be lost through oxidation. Color, odor, and turbidity may increase, decrease, or change in quality. Sodium, silica, and boron may be leached from the glass container. Hexavalent chromium may be reduced to chromic ion.

"Biological changes taking place in a sample may change the oxidation state of some constituents. Soluble constituents may be converted to organically bound materials in cell structures, or cell lysis may result in release of cellular material into solution. The well-known nitrogen and phosphorus cycles are examples of biological influences on sample composition.

"The foregoing discussion is by no means exhaustive and comprehensive. Clearly, it is impossible to prescribe absolute rules for preventing all possible changes. Additional advice will be found in the discussions under individual determinations, but to a large degree the dependability of an analytical determination rests on the experience and good judgment of the person collecting the sample.

Time interval between collection and analysis:

"In general, the shorter the time that elapses between collection of a sample and its analysis, the more reliable will be the analytical results. Changes caused by growth of microorganisms are greatly retarded by keeping the sample in the dark and at a temperature. When the interval between sample collection and analysis is long enough to produce changes in either the concentration or the physical state of the constituent to be measured, follow the preservation practices given.

"Record time elapsed between sampling and analysis, and which preservative, if any, was added."

Preservation methods:

Sample preservation is difficult because almost all preservatives interfere with some of the tests. Immediate analysis is ideal. Storage at low temperature (4°C) is perhaps the best way to preserve most samples until the next day. Use chemical preservatives only when they are shown not to interfere with the analysis being made. When they are used, add them to the sample bottle initially so that all sample portions are preserved as soon as collected.

"Methods of preservation are relatively limited and are intended generally to retard biological action, retard hydrolysis of chemical compounds and complexes, and reduce volatility of constituents.

"Preservation methods are limited to pH control, chemical addition, the use of amber and opaque bottles, refrigeration, and freezing.

"Clearly it is impossible to prescribe absolute rules for the preventing of all possible changes. Additional advice will be found in the discussions under individual determinations, but to a large degree the dependability of analytical determination rests on the experience and good judgment of the person collecting the sample."

II. SAMPLE CONTAINERS AVAILABLE FROM THE LABORATORY

The proper sample container along with preservative (when applicable) should be chosen for each parameter. Table I provides the sample container types and volumes for most of the required tests.

Table II lists the containers for each parameter and the preservatives in each.

III. ANALYSIS REQUEST FORMS AVAILABLE FROM THE LABORATORIES

Each sample submitted to the laboratory must be accompanied with a Request for Sample Analysis. The table below identifies these forms:

Northern Section:	
LAB-808 (7/92)	Request for Sample Analysis (General and Inorganic)
LAB-809 (7/92)	Request for Sample Analysis (Organic)
LAB-803 (12/92)	Request for Sample Analysis (Radiological)
LAB-N-807 (8/93)	Microbiological Determinations
LAB-801 (6/91)	Shellfish Determinations
Southern Section:	
SRLform26 (9/22/94)	Analysis Request Form (All analyses)

The sample collector must complete all pertinent information in the above forms. If the information is not complete, sample analysis cannot begin and may warrant recollection of the samples. Laboratories have listed the tests they perform only to help the sample collectors recall what the testing parameters are. Request only those tests that are essential for the particular objective. Selecting all tests within a category will not automatically result in their analyses. When questions remain, the laboratories will call sample collectors to verify analytical requests prior to analysis.

If chain-of-custody is required, the sample collector must initiate the process in the field at the time of sample collection.

California State Department of Health Services
Division of Drinking Water and Environmental Management—SRLB

Legend: Full = Full bottle G1/G2 = G1 or G2

Constituent	Type of Bottle	Required Volume (mL)	Constituent	Type of Bottle	Required Volume (mL)
Ammonia-Nitrogen	N	200	PCBs	E	Full
BOD	G2	Full	Pesticides	E	Full
BOD (for seed) Collect before chlorination	G1	100	Petroleum HC (TPH)	H	Full
			pH	G1/G2	25
BNA	E	Full	Phenol	P	Full
Boron (B)	G1/G2	50	Phenols, chlorinated	E	Full
BTEX	V/VT	Two full vials	Phosphate, ortho	M	100
Calcium (Ca)	G1/G2	200	Phosphate, total	M	200
Chloride	G1/G2	200	Potassium (K)	G1/G2	50
COD	N	100	Radiochemical	2 × G2	Full
Color	G1	100	Residual chlorine	R	200
Cyanide	C	Full	Settleable matter	G2	1000
EDB/DBCP	V	Two full vials	Sodium (Na)	G1/G2	50
Fluoride	G1	25	Specific conductance	G1/G2	200
General Mineral	G2	Full	Sulfate	G1/G2	50
Hardness	G1/G2	200	Sulfide	S	50
Herbicides	E	Full	Suspended solids	G1/G2	200
Iron (Fe)	G1/G2	50	TDS	G1/G2	200
Kjeldahl-Nitrogen	N	200	Total alkalinity including: Bicarbonate Carbonate Hydroxide	G1/G2	200
Magnesium (Mg)	G1/G2	50			
Manganese (Mn)	G1/G2	50			
MBAS	M	200	Total nitrogen	N	Full
Nitrate, Nitrate-N	N	50	Trace elements	T,t	Full
Nitrite, Nitrite-N	N	50	Turbidity	G1/G2	50
Odor	D	Full	Volatiles (Non-chlorinated)	V	Two full vials
Oil & Grease	O	1000			
Organic Nitrogen	N	200	Volatiles (Chlorinated)	VT	Two full vials

For solid samples such as soils, sediments and sludges, collect the sample in one container (bottle type: W) for any type of analyses.

Table I

INFORMATION ON USING THE SAMPLE CONTAINERS

l samples must be kept cool after sampling except for Trace Elements. Do not rinse the sample bottles before use.

Bottle Type	To be used in sampling for:	Preservative added:
B	Microbiological tests	Sodium thiosulfate
C	Cyanide	Sodium hydroxide
D	Odor	None
E	Extractables such as: BNA, EDB/DBCP, Herbicides, PCBs, pesticides	None (solvent washed)
G 1 (pint) G 2 (½ gallon)	(For general use) BOD, Boron, Color, General Mineral, Hexavalent Chromium, Settleable Solids, Specific Conductance, Sulfite, Suspended Solids, Turbidity.	None
H	Petroleum Hydrocarbons	Sulfuric acid
M	MBAS and Phosphate	None (HCl acid washed)
N	Nitrogens: Ammonia & Kjeldahl Nitrogen, Nitrate, Nitrite, Organic Nitrogen, Total Nitrogen, COD	Sulfuric acid
O	Oil & Grease	Sulfuric acid
P	Phenol	Sulfuric acid
R	Residual Chlorine (put in 200 mL only)	PAO and acetate buffer
S	Sulfide (only)	Zinc acetate and sodium hydroxide
T,t	Trace Elements Take two, one big and one small.	Nitric acid (big) None (small)
V	VOC for non-chlorinated water. Two vials for each sample site.	None (heated)
VT	VOC for chlorinated water. Take two vials for each sample site.	(heated); Sodium thiosulfate
W	Solid wastes: soil, sediments, sludge	None

For other types of analyses, please contact the laboratory.

eneral Mineral includes:
Total Alkalinity (Bicarbonate, Carbonate, Hydroxide), Calcium, Chloride, Fluoride, Total Hardness, Iron, Magnesium, Manganese, Nitrate, pH, Potassium, Sodium, Sulfate, Specific Conductance and TDS.

race Elements include:
Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Selenium (Se), Silver (Ag), Zinc (Zn).

Heavy Metals include:

Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Lead (Pb), Mercury (Hg), Selenium (Se), Silver (Ag).

Please avoid submitting samples for:	Microbiological tests	on Thursday and Friday.
	Residual Chlorine	on Friday (after 12:00 noon).
Please submit samples for:	BOD	by appointment only.

otes: If you know in advance that the samples contain high level of toxic or dangerous compounds *e.g.*, cyanide, sulfide, etc., please note on Analysis Request Form under "Warning"

Table II

IV. BIOLOGICAL SAMPLES AND DETERMINATIONS

Before collecting large numbers of samples, or for more information, communicate with the laboratory. In northern California, call Ray Bryant at (510) 540-2077 or Dr. Daniel C. Mills at (510) 540-2172 in the Microbial Diseases Laboratory. The laboratory's general number is (510) 540-2242. In southern California, call Bill Steeber in the Sanitation and Radiation Laboratory (South) at (213) 580-5739 or (213) 580-5795.

A. Coliform Group

Sample Bottle

The laboratory can provide prenumbered sterile four (4) oz. wide-mouth containers containing enough sodium thiosulfate to give a concentration of 100 mg/L of sample.

Collection of Samples

Care must be used to protect the sample from contamination. Permit only the water sample to contact the inside of the bottle and the bottle cap.

DO NOT RINSE OUT BOTTLE PRIOR TO FILLING.

To collect a sample other than from a tap, hold jar near the bottom, remove bottle cap; plunge jar mouth downward, to an appropriate depth moving hand and jar in a wide arc away from the body. If the water being sampled is flowing, direct the mouth of the jar against the flow.

To collect a sample from a tap, select a tap in frequent use and run the water for 2-3 minutes or until temperature has stabilized before filling the bottle. Avoid leaky taps since water flowing over the external surface of the tap may contaminate the sample.

About 1/4 to 1/2 inch of air space should be left above the sample.

Sample Identity:

Identify samples by filling out the report forms (Form LAB-807 (8-93)). Request dilutions and tubes per dilution required. Use same sample request form for determination of total coliform, fecal coliform (EC), fecal enterococci, and standard plate count. If fecal streptococci is requested, check appropriate box on slip and write in fecal strep.

Sample Transportation and Storage

Examine samples as soon as possible after collection. Not more than 30 hours may elapse between sampling and analysis. Thirty hours is acceptable for samples mailed from treatment systems; otherwise, 6 hours are specified in EPA's *Microbiological Methods*.

Keep samples at 1-4°C during storage, but do not freeze. Use reusable freezing gels in portable insulated box for cooling and shipping. Avoid using ice or dry ice.

Schedule sample collection with delivery services to minimize delays. Do not send samples by U.S. Mail without refrigeration.

B. Standard (Heterotrophic) Plate Count

Collect samples using same procedure and containers as for the coliform determination.

Not more than 6 hours may elapse between sampling and analysis.

C. Sewage-Swab Samples (for Salmonella) by Prior Arrangement with EMBS-MDL

Sampling Materials

- Bagged sterile swab with attached string.
- Sterile 8 oz bottle for transportation of swab.

Collection of Samples

Take care to protect the swab and the samples from contamination. Prepare sampling site for the swab; carefully remove the swab from the bag touching only the free end of the string, insert the swab into the flowing sewage, and securely fasten the free end of the string. After an appropriate period of time (1-5 days), carefully remove the swab from the sewage and place it in the sterile bottle.

Sample Transportation

With minimum delay ship directly to the Environmental Microbial Diseases Section - Microbial Diseases Laboratory (EMDS-MDL) in Berkeley. Refrigerate the sample in transit. (See IV.A above: *Sample Transportation and Storage.*)

D. Giardia and Cryptosporidium Samples

Large volume (400-4000 liters) sampling of water sources is required to achieve acceptable sensitivity for the detection of these parasites. Water is filtered through the 1 micron pore size cartridge filter using motorized or hand-driven pump.

Sample Size

Consult the EMDS-MDL for guidance in determining the volume of water to filter.

Submit the entire filter cartridge and water remaining in the filter housing in a clean, sturdy plastic bag. Store samples refrigerated until examined, usually within 72 hours.

E. Shellfish Samples for Bacteriological Analysis

Samples of shell stock and shucked but unfrozen shellfish must be examined within 6 hours after collection. Store frozen samples at less than 10°C, but never exceed 24 hours.

Shell stock samples should be collected in clean, dry containers. Provide 10-12 shellfish or a minimum weight of about 200 g of meat and shell liquor.

Shucked shellfish are preferably collected in the final container for retail sale.

F. Samples for Marine Biotoxin Analysis

Examine shellfish as soon as possible after collection. Shell stock may be collected in clean, plastic bags providing at least 150 g of meat. Shucked shellfish may be collected in the final container for retail sale.

Samples which cannot be analyzed promptly should be shucked, drained for 5 minutes and frozen. At least 15 to 20 individuals (150 g of meat) should be collected per sample. Analyses are made only in the EMDS-MDL in Berkeley.

See attachment 1 for more information on sampling.

G. Iron Bacteria

Any wide mouth bottle is suitable. The bottle need not be sterile. In collecting the sample include a significant amount of iron-containing slime. Use no preservative. The sample should be held no longer than 2 days.

H. Plankton

Sampling for plankton requires proper equipment and training. This is activity routinely performed by the Shellfish Biotoxin Section of the Environmental Management Branch. If you need information or assistance for plankton sampling contact that section.

V. GENERAL AND INORGANIC CHEMICAL DETERMINATIONS

Prior to collecting large numbers of samples, or unusual samples, make arrangements with the laboratory. Submit sufficient sample using appropriate containers for the test. Table I on page 8 summarizes containers and sample volumes for many common analytes. To conserve space, the table and the section below list only the most common analytes. The laboratory can answer questions about others.

Do not rinse sample bottles containing preservative—simply fill them. Completely and correctly fill in the "Request for Sample Analysis" forms, specifying the analyses desired. For further information about the analyses please contact Ms. Tina Parangalan (SRLB-North) at (510) 540-2751 or 2201, or Mr. Bill Steeber (SRLB-South) at (213) 580-5739.

Acidity and Alkalinity

Completely fill a 500 mL plastic (G1) bottle. Have the analysis done as soon as possible, preferably within one day after sample collection. Refrigerate sample during storage.

Aluminum

Collect 500 mL in a plastic bottle and analyze within 1 day. If the analysis is to be for soluble aluminum, filter the sample in the field through a membrane filter (0.45 μm pore diameter) and submit the filtrate for analysis.

Biochemical Oxygen Demand 5 days (BOD_5)

Because of rapid changes in the BOD, arrange for analysis the day the sample is collected. Collect 1/2 gallon in a (G2) plastic bottle, keep refrigerated, and do not add any preservatives. Indicate the expected BOD range in completing the report form.

Boron

Collect sample in 500 mL plastic (G1) bottles.

Carbon, Organic and/or Inorganic

Collect sample in 4 oz organic free glass bottle. Keep cool and analyze as soon as possible.

Chemical Oxygen Demand (COD)

The analysis should be made within seven days of collection and preservation. Use an N bottle, which already contains sulfuric acid as a preservative. Alternatively, samples should be refrigerated or may be preserved by acidifying with H_2SO_4 to pH 2.

Chlorine, Residual

If the laboratory will analyze the sample, collect in an R bottle, ice it, and submit it as soon as possible. Alternatively, analyze residual chlorine in the field, using field kits provided by the laboratory.

Chlorophyll

Collect sample in 500 mL plastic bottle. Submit to lab as soon after sampling as possible.

Chromium

New 500 mL plastic bottles should preferably be used to collect samples. This will minimize adsorption of the chromium on the surface. If hexavalent chromium is to be determined, the sample must be refrigerated and analyzed within 24 hours after collection. For total chromium, collect sample in 500 mL plastic bottle containing 0.8 mL reagent grade or higher purity HNO_3.

Color

Collect samples in 500 mL glass bottles and refrigerate at 4°C. Determination must be made within one day.

Cyanide

Cyanides are very unstable and should be analyzed as soon after sample collection as possible. Fill one (1) liter or larger plastic sample bottle completely, and if immediate analysis is not possible, preserve the sample by adding NaOH to raise the pH to 12 or more. (Usually 10 mL or 50% NaOH per 500 ml sample). A C bottle is available, which already contains the preservative.

Fluorescein (or Other Dye Tracers)

Collect in solvent-washed 500 mL glass bottle. Refrigerate and analyze on the same day as collected. A sample of the dye used should be submitted along with a sample of untreated water.

General Mineral Analysis: total dissolved solids, hardness, alkalinity, calcium, magnesium, iron, manganese, sodium, potassium, chloride, sulfate, fluoride, nitrate, pH and specific conductivity (as part of QC)

Collect ½ gallon in a glass or plastic container (G2 bottle). Refrigerate and deliver to the laboratory as soon as possible or within 3 days. To sample for individual analytes in the group which are not covered specially in this section, use a plastic bottle without preservative (G1 or G2). Observe the volume requirements listed in Table 1 (page 8) to ensure there is sufficient sample for *all* analytes.

Manganese

Because manganese is adsorbed on glass, delays between sampling and analysis should be eliminated. Collect sample in 500 mL plastic bottle, and add Suprapur® HNO_3 to pH 2. Preferably, use the T bottles, and sample as for metals, described below.

MBAS (Methylene Blue Active Substances) - Detergents

Collect sample in an M bottle, which has no preservatives, but has been specially cleaned. It is necessary to use a glass container of at least 500 mL capacity. Cool to 4°C.

Metals

The laboratory is capable of analyzing for a wide spectrum of metals. If requesting only metal analysis, the general procedure is to submit *two* containers. The actual analysis for metals will be done on the liquid in the T bottle, which contains nitric acid preservative. The smaller t bottle contains no preservative, and enables the analyst to evaluate the water for quality control purposes.

Metals, Heavy (Cobalt, Molybdenum, Titanium, Vanadium)

Serious errors can be introduced during sampling and storage. Allow samples to contact only acid-washed plastic. Collect sample in two T bottles (one large and one small). The large bottle contains nitric acid preservative. It is permissible to take sample in 500 mL plastic bottle and add 0.8 mL Suprapur® HNO_3.

Metals, Trace (Arsenic, Antimony, Barium, Beryllium, Cadmium, Copper, Iron, Lead, Nickel, Thallium, Zinc)

Sample collection is the same as the prior paragraph.

Nitrogen: Ammonia, Nitrate, Nitrite, and Organic Nitrogen

The form in which nitrogen appears can be changed by biological activity. Collect in an N bottle, which contains sulfuric acid preservative. Transport or store as close to 0°C as possible. Alternatively collect in a 1/2 gallon plastic bottle and add 1 mL concentrated H_2SO_4/L.

Odor (and Taste)

Collect sample by completely filling a clean and odor free 1 liter glass bottle (D bottle). Refrigerate. Analyze on the day collected.

Oil & Grease

Collect in an O bottle, which contains sulfuric acid preservative. Refrigerate and submit as soon as possible to the laboratory. Sludge samples may be preserved with 1 mL concentrated H_2SO_4 per 80 g of sludge. Acidified samples may be stored for 3 weeks under refrigeration.

Oxygen, Dissolved

Collect sample with minimal aeration. Completely fill the BOD bottle. Analyze in the field using kit appropriately calibrated according to manufacturer instructions. If the laboratory will do the analysis, the sample should be submitted without delay.

pH

Bring a refrigerated sample back to laboratory as soon as possible after collection. If possible make pH measurements in the field using pH meters available from the laboratory.

Phenol

Collect in P bottle, which contains sulfuric acid as a preservative. Cool the sample to 4°C for transport to the laboratory. If a P bottle is not available, and sampling is imperative, use a clean glass container, cool to 4°C, and deliver immediately to the laboratory.

Phosphate

Collect sample in an M bottle, which has no preservative. If soluble phosphates are to be differentiated, field-filter the sample through a membrane filter (0.45 μm pore diameter) and preserve by adding 2 mL of conc. H_2SO_4.

Silica

Collect samples in 500 mL plastic bottles. May be kept 3 weeks under refrigeration.

Sludge and Bottom Sediments

Analyses should be made as soon as possible. If stored, preserve by adding 5 g sodium benzoate or 1 mL concentrated H_2SO_4 per 80 g sample. Check first with laboratory for possible interferences and to schedule sampling. Four-oz bottles (subsection 2.1.2) are convenient for samples of this kind.

Solids, Settlable

Collect one half gallon in a container without preservative (G2 bottle). Cool to 4°C and deliver to the laboratory on the same day.

Solids, Suspended

Collect one half gallon in a container without preservative (**G2** bottle).

Sulfides

Collect 500 mL with minimal aeration in a plastic bottle. For dissolved sulfides determine in the field within 3 minutes of collection with a field kit suitably calibrated according to manufacturer instructions. Total sulfide samples must be preserved, and the laboratory provides **S** bottles for this purpose.

Temperature

Contact laboratory for calibrated thermometers to be used at the time of sample collection. Determine on site.

Turbidity

If the laboratory will perform the test, take sample in a 500 mL or larger plastic bottle, without preservative (**G1** or **G2** bottle), hold in the dark, and submit to the laboratory on the same day. Turbidity may be analyzed in the field. Determine turbidity in the field using a portable turbidimeter which the laboratory has calibrated.

VI. RADIOLOGICAL DETERMINATIONS

The Radiochemistry Unit of the Sanitation and Radiation Laboratories Branch-North (SRLB-N/RCU) serves a number of different clients. These include, but are not limited to, the Division of Drinking Water and Environmental Management (DDWEM), the Radiologic Health Branch (RHB), and the Environmental Management Branch (EMB). Considering the large number of programs which the laboratory supports, it is important to coordinate sample collection to best utilize the laboratory resources. Before sampling, the collector should contact Carolyn Wong in the laboratory at (510) 540-2209 or 2513 (8-571-2513). The sample collection must be scheduled so samples arrive at a time when the laboratory may accomodate them. The call also serves to request delivery of necessary sample collection supplies and to obtain additional information.

The laboratory maintains supplies of appropriate containers for each type of analysis carried out in this laboratory. Any supplies the collector needs can be obtained from the laboratory. They are sample containers, packing materials, shipping chests, labels, and Request for Sample Analysis (Form 803) forms.

General Procedures

Preauthorization to submit samples to the laboratory is required. All sample collection activities must be prearranged with the laboratory, with the exception of the following routine programs:

- Environmental samples from four nuclear power plants
- Water samples from special projects - Division of Drinking Water and Environmental Management
- Special project environmental samples - Low Level Radioactive Waste, Office of Radon, U.S. Department of Energy
- Performance evaluation and interlaboratory comparison study samples - U.S. EPA
- Quality assurance samples - SRL (blind, internal)

Sample collectors will wear disposable gloves to avoid sample contamination.

All tools, including trowels, forceps, etc., for manipulating samples must be either single-use and therefore disposed of directly, or cleaned of contamination by or adequately rinsing with detergent and deionized water and drying, and the waste disposed of properly.

Submit a Request for Sample Analysis (Form 803) with each sample. The name, address and telephone number of the person requesting the analysis should be filled in legibly in the appropriate box on the Request for Sample Analysis. Complete in full all of the boxes on the form that ask for the sampling site, sample type, analyses requested, collection date and time.

If the samples were taken from a contaminated area as indicated by a survey meter, report the survey meter measurements on the Request for Sample Analysis.

Clearly state any known hazardous components in a sample in the comment section on the Request for Sample Analysis. Examples of the hazardous components are medical wastes, sewage, radioactive ore, reclaimed water, carcinogens, sharp objects, etc.

Note any preservatives added to the samples on the Request for Sample Analysis.

Do not insert the Request for Sample Analysis form in the same bag or container as the sample. Instead, place it in a small Ziplock® bag by itself. Zip the bag closed and place in it in the same shipping box with the sample, but not in the sample bag or container. Place the self adhesive label with the R number, accompanying the Request for Sample analysis, on the sample container.

If the sample contains water, put the sample in an air-tight plastic container with a screw cap. Then place the container in a plastic bag to avoid leakage.

Tie plastic bags with twist ties, not with paper tape. Paper tape does not adhere adequately to the plastic bags and can come apart during transit.

Package the samples securely in a shipping box to withstand the rigor of transportation.

Since all samples may potentially end up as evidentiary material in a court of law, documentation for chain-of-custody is important. Proper chain-of-custody must be maintained from the time of sampling until the generation of laboratory report(s) to adequately support chain-of-custody for litigation purposes. The U.S. Postal Service is adequate for samples that do not require stringent chain-of-custody. If stringent chain-of-custody is required the collector should deliver the samples directly to the laboratory.

Package samples to be transported to meet the U.S. Department of Transportation guidelines specified in the Code of Federal Regulations. Common carriers the samples collectors deal with routinely may be used for sample transportation.

Ship or deliver the samples to the following address:

California State Department of Health Services
Sanitation & Radiation Laboratories - Radiochemistry Unit
2151 Berkeley Way, Room 119
Berkeley, Ca 94704-1011

The collector should call the laboratory at 510-540-2513 upon shipping the samples so that the laboratory can track the arrival of the samples. If the samples are not received in due time, the laboratory personnel can call the collector to apprise him of the problem.

The following table summarizes the volume requirements, preservatives and recommended transit times for radiological analytes. The specified volumes are required for the analysis itself and for routine quality control. The recommended transit time is the maximum time that should elapse between sampling and submission to the laboratory. Samples that exceed these times might not be analyzed. The laboratory may have to reject an analytical request depending on the radionuclide sought, the decay of short half-life radionuclides and/or sample spoilage.

Analysis	Volume	Container	Preservative	Recommended Transit Time
Gross α	0.5-3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Gross ß	0.5-3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Gross α/ß	0.5-3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Gamma scan	3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
^{3}Hydrogen/^{14}Carbon	500 mL	Glass	None	3-5 days
^{89,90}Strontium	3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
^{131}Iodine	1-3.8 L	Plastic	None	3 days
^{226,228}Radium	3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Natural Uranium-Radiometric	3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Natural Uranium-Laser Phosphorimetry	100 mL	Plastic	Conc. HNO_3 to pH<2	3-5 days
Plutonium	1-3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Radon	160 mL	French square bottles - glass	None	1 day

Table III

Procedures for Water

Gross Alpha and Gross Beta Analysis

Materials

- Request for Sample Analysis (Form 803)
- Plastic Bottle - 1 Liter (1 Quart) with cap or
- Cubitainer - 1 gallon polyethylene with cap
- Nitric Acid, 70% (conc.) - analytical grade

Sample Size - 1 Liter (1 Quart), 1 liter of sample is generally enough for gross alpha and gross beta analysis; however, if other analyses are required, a 1 gallon sample should be submitted.

Field Preservation - Add enough nitric acid (70%, conc.) to bring the sample to pH < 2 (2 ml nitric acid per liter is generally enough). Preserved samples may be held for 6 months. If nitric acid is not available in the field, ship the sample to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Preserve as above, and label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Tritium and Carbon-14 Analysis

Materials

- Request for Sample analysis (Form 803)
- 250 mL Boston round glass bottle, with cap

Sample Size - 250 mL

Field Preservation - Do not add any preservatives to this sample. Ship the sample to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803). A separate sample must be collected for tritium and carbon-14 analysis since adding nitric acid as a preservative would make it impossible to run these analyses.

Radon-222 Analysis

Materials

- Request for Sample Analysis (Form 803) and Labels - one for each duplicate sample set. A duplicate sample set consists of two (2) French square bottles (A,B) taken from the same sampling bucket.
- Small plastic bucket
- Tygon® tubing with sampling adapter(s)
- 6-oz. French Square bottle with rubber-lined cap.

Sample Size - Duplicate 6-oz samples taken from the same sampling bucket.

Field Preservation - Do not add any preservatives to this sample. Ship the sample to the laboratory immediately (The half-life of ^{222}Rn is 3.8 days).

Procedure

- Keep sample bottles cold, by making sure the ice pack is frozen and the box containing the bottles is stored away from the sun.
- Purge the system for 15 minutes to ensure collection of a water sample representative of the aquifer. This protocol is consistent with that for VOCs (AB 1803) and for the Division of Drinking Water and Environmental Management (DDWEM) proposed Monitoring Regulations.
- At sampling point attach a Tygon® tubing to port, faucet, tap, etc. using appropriate adapter as necessary. Direct delivery end to the bottom of the bucket and slowly run the water into the bucket for approximately 5 minutes. Discard the water in the bucket at least once and allow the water to overflow during the remainder of the sampling.
- Remove the bottle cap, and with the bottle in an upright position, carefully submerge the bottle and cap. Avoid agitating the water to minimize creation of bubbles. With the bottle underwater, insert the end of the tubing into the bottle and allow the water to exchange to assure a fresh sample. Remove the tubing and cap the bottle tightly while cap and bottle are both under water.
- After removing the capped bottle from the bucket, invert the bottle and check to see if any bubbles are present. If bubbles are present, empty the bottle and start this sample collection procedure over. Collect at least two separate samples (duplicates) from the same sampling bucket.
- Wipe bottles thoroughly, tape the cap with electrical tape in a clockwise direction (the same way the cap screws on), and attach an identification label to each dry bottle. Fill in the Request for Sample Analysis (Form 803) completely. Due to the short half-life of radon ($_{86}Rn^{222}$ $t_{1/2}$ = 3.8 d), it is essential that the date and time of collection be exact.
- Return the samples and any empty bottles with the frozen ice pack to the laboratory by overnight carrier.

Gamma Analysis (for water when gross β > 50 pCi/L)

Materials

- Request for Sample Analysis (Form 803)
- Plastic Bottle - 2 Liter (2 Quart) with cap or
- Cubitainer - 1 gallon polyethylene with cap
- Nitric Acid, 70% (conc.) - analytical grade

Sample Size - 2 Liters (2 Quarts), 2 liters of sample is generally enough for gamma analysis, however if other analyses are required, submit a 1 gallon sample.

Field Preservation - Add enough nitric acid (70%, conc.) to bring the sample to pH < 2 (2 ml nitric acid per liter is generally enough). Preserved samples may be held for 6 months. If nitric acid is not available in the field, ship the sample to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Preserve as above, and label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Radiochemical Analysis (Uranium, Radium and Strontium)

Materials

- Request for Sample Analysis (Form 803)
- Cubitainer - 1 gallon polyethylene with cap
- Nitric Acid, 70% (conc.)- analytical grade

Sample Size - 3.8 Liters (1 Gallon)

Field Preservation - Add enough nitric acid (70%, conc.) to bring the sample to pH < 2 (2 ml nitric acid per liter is generally enough). Preserved samples may be held for 6 months. If nitric acid is not available in the field, ship the sample to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Preserve as above, and label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Procedure for Sewage Effluent

Gross Alpha and Gross Beta Analysis

Materials

- Request for Sample Analysis (Form 803)
- Plastic Bottle - 500 ml (1 Pint) with cap or
- Cubitainer - 1 gallon polyethylene with cap

Sample Size - 500 ml (1 Pint), 500 ml of sample is generally enough for gross alpha and gross beta analysis; however, if other analyses are required, submit a 1 gallon sample.

Field Preservation - Do not add preservatives to these samples. If possible keep the samples refrigerated to prevent undue decomposition. Ship the samples to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Gamma Analysis

Materials

- Request for Sample Analysis (Form 803)
- Plastic Bottle - 2 Liter (2 Quart) with cap or
- Cubitainer - 1 gallon polyethylene with cap

Sample Size - 2 Liters (2 Quarts), 2 liters of sample is generally enough for gamma analysis; however, if other analyses are required, submit a 1 gallon sample.

Field Preservation - Do not add preservatives to these samples. If possible, keep the samples refrigerated to prevent undue decomposition. Ship the samples to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Radiochemical Analysis

Materials

- Request for Sample Analysis (Form 803)
- Cubitainer - 1 gallon polyethylene with cap

Sample Size - 3.8 Liters (1 Gallon)

Field Preservation - Do not add preservatives to these samples. If possible, keep the samples refrigerated to prevent undue decomposition. Ship the samples to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Procedure for Sewage Sludge

Gross Alpha and Gross Beta Analysis

Materials

- Request for Sample Analysis (Form 803)
- Plastic Specimen Container - 100 ml

Sample Size - 75 ml

Field Preservation - Do not add preservatives to these samples. If possible, keep the samples refrigerated to prevent undue decomposition. Ship the samples to the laboratory immediately.

Procedure - Fill the plastic specimen container 3/4 full with a "representative" sample. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Gamma Analysis

Gamma analyses are performed on the same sample as for gross alpha and beta.

Radiochemical Analysis

Not generally performed on these samples.

VII. SAMPLING FOR ORGANICS ANALYSIS

Prior to collecting large numbers of samples, or unusual samples, make arrangements with the laboratory. Use the containers indicated for the test. Completely and correctly fill in the "Request for Sample Analysis" forms, specifying the analyses desired. If you have any questions about the analyses please contact Dr. Bill Draper (510) 540-2201 or 3050 (SRLB-North) or Mr. Bill Steeber (213) 580-5739 (SRLB-South).

Various processes can change the organic chemicals in sampled water before the laboratory analyzes it. **Chemical processes** include hydrolysis and autoxidation and may be very rapid for some compounds. Examples include carbamate and phosphate hydrolysis, disulfoton and aldicarb oxidation. Halogenated compounds are subject to dehydrohalogenation. Oxidants used for disinfection not only sterilize the water, but may also react with dissolved organics to form other compounds. **Photochemical processes** break down compounds like metam-sodium, PAH or trifluralin when the sample is exposed to sunlight. **Microbiological metabolism** may decompose some organics, especially aromatics and unsaturated compounds. **Volatilization** is the loss of compounds from the water to the air, sometimes rapidly.

In devising a sampling protocol, the above issues must be taken into account. There are several ways to ensure that water samples change minimally before submission to the laboratory. These include keeping the sample cold (usually 4°C), getting the samples to the laboratory quickly, adjusting the pH, protecting the sample from sunlight (use brown bottles), removing oxidants by adding reducing agents like sodium thiosulfate, ascorbic acid or ammonium chloride.

General Sampling Procedure

In general, organic chemicals dissolved in water can be grouped into two classes. One group is the purgable compounds, substances which may be volatilized from the water. The non-purgables include base/neutral and acid extractables, organochlorine pesticides, other pesticides, like carbamates, and PCBs. In either case, sample should be taken from a tap at the well head prior to any treatment or storage. The well must be pumped for at least 15 minutes before sampling. Open the sampling tap and allow the water to run until the temperature is stable. Adjust the flow to about 500 mL/minute and collect samples as outlined below.

Sampling VOCs

Of utmost importance are proper collection of the sample, keeping the sample cool in an ice chest, and quick delivery to the laboratory.

To minimize change in the sample, a preservative may be added to the sample. There are two main types of preservative. To remove residual chlorine that may be present in treated samples, use a reducing agent like ascorbic acid or sodium thiosulfate. The reducing agent must be present in the sample container before sampling.

The other kind of preservative prevents biological degradation of the sample. For this purpose, the EPA specifies the use of hydrochloric acid as a biocide. Addition of HCl must be done after sampling, because otherwise it may react with the reducing agent. Use care adding the preservative. It is very corrosive to both person and property. There is also some potential for contamination through excessive handling of the sample.

To sample for VOCs, use the laboratory-provided VOC vials (there may be either clear or amber vials labeled VC and VA, respectively). Follow these steps while taking the sample:

- All samples are to be taken in duplicate.
- If samples are to be analyzed for THMs and/or are suspected to contain residual chlorine, make sure that a reducing agent is present in the laboratory-provided vial. Or add 25 mg of ascorbic acid or 3 mg of sodium sulfite per 40 mL of sample to all sample bottles before the samples are collected.
- Fill the bottles just to overflowing, being careful not to flush out the rapidly dissolving reducing agent.
- If the samples are to be analyzed for VOCs, they may preserved by adding one drop of 1:1 HCl per 20 mL of sample to the already full sample bottles.
- Seal the sample bottles, making sure the Teflon® side of the septum faces toward the sample. Shake the sample vigorously for one minute. Invert the sample and observe whether any air bubbles are trapped in it. If bubbles are apparent, the sample is invalid and a new one must be collected.
- Immediately cool the samples to 4°C. Samples must be stored at this temperature in an area free from any organic solvent vapors until analysis. Holding times vary by method.
- By the time the sample arrives at the lab, a small bubble may have developed. As long as this is no larger than a pea, the sample may be considered valid.

The methods used by the laboratory to examine the sample are extremely sensitive. The levels of organic compounds typically in the low parts per billion may easily be obscured by contaminants. To avoid artifacts (contamination) during and after sampling, bear in mind the following:

- Use appropriate containers and closures.
- Use properly cleaned, rinsed and dried containers.
- Store samples (especially VOAs) away from solvents, gasoline, etc.
- Store drinking water samples separate from waste samples.
- Avoid rubber and plastic tubing (i.e., Tygon®), plastic containers and inappropriate cap liners.
- Avoid unnecessary handling of samples with plastic gloves.

Sampling Other Organics

Non-purgeables (EPA Method 504)

Collect samples in 40 mL vials containing 3 mg sodium thiosulfate. Cap bottles with Teflon®-lined cap. Samples must be refrigerated at 4°C from the time of collection and analyzed within 28 days.

Organohalogen Pesticides and Aroclors (EPA Method 505)

Collect sample in 40 mL vials containing 3 mg sodium thiosulfate. Cap bottle with Teflon®-lined cap. Samples must be refrigerated at 4°C from the time of collection and analyzed within 14 days. See Method.

*Other Pesticides (EPA Methods 507, 508, *508A, 515.1, 531.1)*

The sampling, preservation, and storage conditions for agricultural chemicals and pesticides shall be: to collect samples in one (1) liter amber bottles; fill bottle so that the headspace is no greater than the threaded portion of the neck; cap bottle with Teflon®-lined cap and refrigerate at 4°C from time of collection. The EPA specifies an exception for carbamates like Aldicarb. Acceptable holding time maxima for extraction and analytical stages vary for analytes and methods.

Carbamates: The EPA considers this class of compound very labile, subject to rapid degradation. To protect the sample, they specify pH adjustment, buffering, and freezing the sample. Before sampling for carbamates, call the laboratory for specific instructions.

(GC/MS) Base/Neutrals, Acids and Pesticides (EPA Method 525)

Keep samples iced or refrigerated at 4°C from the time of collection until extraction. Protect sample from light. All samples must be extracted within seven days and completely analyzed within 30 days of extraction.

Organics - General (Grease, Petrochemicals, Petroleum, etc.)

For water where there is little or no visible pollution, collect two one liter samples in a solvent-washed amber glass bottle with a solvent washed, Teflon® lined cap. Plastic gloves, rubber or plastic materials, oils, waxes or other products can contaminate water samples and give misleading test results.

Samples taken for organic analysis should not contact anything but the clean sample bottle. Keep samples cool and deliver to the laboratory as soon as possible. When appropriate, collect small samples of reference materials in 1 or 2 oz solvent-washed jars to facilitate the analytical work but be very careful to avoid contaminating the sample.

The following table contains information excerpted from EPA documents, and details sampling guidelines for organics analysis.

Test Method		Sample Container	Volume Needed	Preservative/ Comment
502.2 524.2 503 624	Volatile organics Volatile organics Volatile aromatics Volatiles (Wastewater)	40 mL VOA	40 mL	a, b, c, n
504	EDB/DBCP	40 mL VOA	40 mL	a, b, c, n
505	Chlorinated Pesticides/PCBs	40 mL VOA	40 mL	a, b, d
551	Chlorinated DBP	40 mL VOA	40 mL	l, b
m-8015	TPH-Gasoline (& BTEX)	40 mL VOA	40 mL	
507 508	N- & P-Pesticides Chlorinated Pesticides	1 L glass	1 L	b, e, f, g, h
509	ETU	60 mL glass	50 mL	b, d
515.2	Chlorinated Acid	1 L glass	50 mL	b, e, h, i, j
525.1 625	Semivolatiles Semivolatiles (Wastewater)	1 L glass	1 L	b, e, i, j, h
531.1	Carbamate Pesticides	60 mL glass	1 L	b, j
547	Glyphosate	60 mL glass	60 mL	b, h, k
548.1	Endothall	1 L glass	1 L	b, e, h, i, j
549.1	Diquat/paraquat	1 L amber PVC or silanized glass	1 L	b, h ,i, k
552.1	Haloacetic acids	1 L glass	1 L	b, d, h, m
555	Chlorinated acids	1 L glass	1 L	b, h, i, j, p
418.1 or m-8015	TPH-Diesel & Motor oil	1 L glass	1 L	

Table IV

Keys to the preservatives and comments column in Table IV:

a Remove residual chlorine with sodium thiosulfate or ascorbic acid.
b Store and transport at 4°C.
c Adjust to pH<2 by adding 1 drop of 1:1 HCl.
d VOA vial should be dried in a 400°C oven.
e If residual chlorine is present, add 80 mg of sodium thiosulfate.
f 1.0 mL of 10 mg/mL HgCl has been added as a bactericide, but SRLB does not recommend use of this preservative. Some of the method analytes (507, 508) are unstable regardless of the preservation technique and therefore samples should be analyzed immediately.
g Prerinse bottle with sample.
h Avoid light during storage.
i Add 1:1 HCl at the time of sampling to obtain pH<2.
j Do not prerinse bottle with sample.
k Add 100 mg/L sodium thiosulfate (6 mg/60 mL).
l Method 551 analyzes for THMs, halogenated solvents, and additional organic DBP. Appropriate preservation varies depending on the analytes of interest: THMs follow generic sampling procedure except dechlorinate by adding 4 mg of sodium thiosulfate, sodium thiosulfite, or ammonium chloride, or 25 mg of ascorbic acid; to determine all DBP use ammonium chloride. Ammonium chloride preservation, however, requires sample acidification—before sampling you must determine the amount of 0.2N HCl required to adjust the sample pH to 4.5-5 by dropwise addition to 40 mL of the water (with the ammonium chloride) in a 100 mL beaker. If recoveries of chloral hydrate are low in the water studied, preserve with 100 mg/L sodium sulfite or 625 mg/L ascorbic acid.
m Add 100 mg/L ammonium chloride.
n Generic VOC sampling procedure and general precautions: Collect all samples in duplicate in 40 mL VOA vials, a travel blank is required for each sampling site, if the water contains residual chlorine destroy it by adding 25 mg of ascorbic acid or 3 mg of sodium thiosulfate before filling. Don't use thiosulfate where fixed gases are being determined as it can interfere. Fill the bottles slowly to just overflowing, but take care not to flush out the reducing agent. Adjust the pH to <2 by adding 1 drop of 1:1 HCl, seal the vial with PTFE side down, mix vigorously for 1 min. Store at 4°C prior to analysis. Alway store samples with their respective travel blank, never store near solvents, motor fuel or highly contaminated samples. The VOA vials (and septum caps) should be washed with detergent and rinsed with tap and distilled water, air dried and then place in an oven for 1 hr. Cool vial in an area free of organic solvents.
o Add 1.8 mL monochloroacetic acid buffer. To remove residual chlorine add 5 mg of sodium thiosulfate.
p To remove residual chlorine add 5 mg of sodium sulfite/100 mL.

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APPENDIX H

Screening and Prioritization Matrix of Recommended Actions

Item No.	Recommended Action	TAC Initial Screening Process	Relative Cost	Readiness to Proceed	Feasibility/Implementability	Leveraging Opportunity	Community & Political Support	Multi-Objective/Supports Watershed Health	Notes
5.1.1	*Involving the Public*								
1	1) Circulate copies and publish the adopted Plan and subsequent periodic reports on website.								
2	2) Develop an informational flyer on the Plan to accompany mailings from water agencies and companies, as well as mailings to private well owners.								
3	3) Develop and execute a Public Outreach Plan for Plan implementation, which will help maximize outreach on implementation activities, and will encourage public attendance at key advisory meetings and workshops for input.								
4	4) Develop outreach information that is comprehensible by public members with different levels of education and technical knowledge.								
5	5) Conduct public forums at key milestones to encourage public participation.								
6	6) Maintain email and postal mail lists to announce meetings and keep interested parties informed about Plan implementation.								
7	7) Invite interested parties to participate in Panel meetings.								
8	8) Meet with representatives from interested organizations as appropriate and get feedback.								
9	9) Coordinate meetings and conduct briefings within the SRPW to provide information and solicit and report input on the management responsibilities and activities relative to this Plan.								
5.1.2	*Advisory Groups*								
10	1) Following Plan adoption, the current Panel will discuss and recommend the composition of the Panel and the Technical Advisory Committee for Plan implementation.								
11	2) Conduct quarterly meetings with the Panel to inform and seek guidance on implementation.								
12	3) Conduct monthly TAC meetings, as needed, to obtain technical input on the various aspects of Plan implementation.								
5.1.3	*Informing Stakeholders & Public Agencies*								
13	1) Continue to maintain and further develop relationships with local, state and federal agencies and organizations to benefit Plan implementation while maintaining local control.								
14	2) Coordinate and inform land use planning with surface water and groundwater management activities by providing periodic briefings on water and groundwater management activities to local land use planning agencies.								
15	3) Conduct briefings with the elected officials who have adopted the Plan in conjunction with implementation milestones and annual reporting.								
16	4) Provide information to increase public awareness of current and future water supplies, demands, and trends in reliability related to a changing climate.								
5.1.4	*Partnerships & Coordination*								
17	1) Continue to promote partnerships that achieve goal and objectives of the Plan.								
18	2) Coordinate Plan implementation activities, collaborate and work to the extent practicable with watershed groups, local stewardship groups, water interest groups, land use planning and management agencies, and state and federal regulatory agencies that have jurisdiction in areas related to Plan activities.								
19	3) Coordinate efforts to seek grant funding for Plan recommended actions in the Plan Area.								
5.2.1.1	*Groundwater Level Monitoring*								
20	1) Conduct systematic, coordinated groundwater elevation monitoring of existing programs and assess groundwater elevations on an annual basis for trends, conditions and adequacy of the existing groundwater level monitoring network.								

Item No.	Recommended Action	TAC Initial Screening Process	Relative Cost	Readiness to Proceed	Feasibility/Implementability	Leveraging Opportunity	Community & Political Support	Multi-Objective/Supports Watershed Health	Notes
21	2) Develop an outreach program to obtain groundwater level data from volunteer private well owners, private producers, and mutual water companies in the Plan Area.								
22	3) Coordinate with local, state and federal agencies to investigate opportunities to develop better information on groundwater level monitoring, including projects such as groundwater recharge to incorporate project-specific monitoring.								
23	4) *Expand existing groundwater level monitoring network to establish more extensive long-term monitoring well network. Expand* groundwater elevation monitoring through cooperative and volunteer efforts and trjhouh the installation of new multi-depth monitoring wells.	8	$$	M	H	H	H	H	
5.2.1.2	*Groundwater Quality Monitoring*								
24	1) Assess water quality on an annual or biennial basis for trends, conditions and adequacy of the groundwater quality monitoring network. This will include preparing tables of analytical results, and developing water quality plots and figures, in conjunction with well hydrographs and groundwater level contour maps for the Periodic Plan Implementation Report, described in Section 6.3.								
25	2) Identify opportunities to capture and integrate existing water quality data for areas where current data is insufficient, including contributions from the DPH, small water distribution system operators (wineries, restaurants, schools and parks), mutual water companies (non-urban residential subdivisions), and other entities.								
26	3) Integrate other monitoring programs established through efforts such as the NCRWQCB Dairy Program, local recycled water projects and the Salt and Nutrient Management Plan for the Santa Rosa Plain.								
27	4) Project to conduct groundwater quality monitoring: Establish and fund a basin-wide, standardized, coordinated, long-term groundwater quality monitoring network in conjunction with groundwater level monitoring. Consider selecting an appropriate sampling of wells (both public supply and volunteer private wells) to monitor for groundwater quality through cooperative and volunteer efforts.	6	$$$*	H	H	H	H	H	
5.2.1.3	*Inelastic Land Surface Subsidence Monitoring*								
28	1) Identify the available data related to potential inelastic land subsidence due to groundwater extraction in the Plan Area: a) Existing survey data b) Plate Boundary Observatory (PBO) GPS Stations								
29	2) Evaluate potential benchmark locations for periodic monitoring of land subsidence related to groundwater extraction in the Plan Area: Discuss and coordinate among the Agency, Cotati, Rohnert Park, Santa Rosa, Sebastopol, and Windsor to determine suitable benchmark locations and/or supply wells in the Plan Area, to aid the analysis of potential land subsidence.								
30	3) Develop an outreach program for City, County and other institutions responsible for infrastructure to provide information regarding likely indicators of subsidence.	5	$	M	M	M	M	L	
31	4) Develop monitoring program and network for assessing the potential for inelastic land subsidence due to groundwater extraction; long-term land surface elevation changes to determine whether such changes are elastic and/or inelastic. Potential components could include: a) Semiannual surveying of a network of benchmarks and other survey points in areas where previous data and (or) groundwater-level declines within confined aquifer zones suggest the potential for subsidence b) Continued monitoring of sites recorded and reported through the existing PBO GPS stations.	1	$$*	M	M	H	M	L	
5.2.1.4	*Surface Water-Groundwater Interaction Monitoring*								
32	1) Continue to compile available stream gauge data and information on tributary flows in the Plan Area.								
33	2) Determine current surface water quality sampling being conducted in the Plan Area.								

Item No.	Recommended Action	TAC Initial Screening Process	Relative Cost	Readiness to Proceed	Feasibility/Implementability	Leveraging Opportunity	Community & Political Support	Multi-Objective/Supports Watershed Health	Notes
34	3) Project to analyze and as necessary re-activate existing stream gauges and install new gauges in the Plan Area: Three stream gauging stations that measure discharge and stage in the Plan Area would be analyzed for priority and need of evaluating water budget and surface water-groundwater interaction evaluation purposes. Stream gauges would be re-activated or added based on need and usability.	7	$$*	H	H	H	H	H	
35	4) Project to install new shallow monitoring wells along major watercourses: Install new wells along major watercourses to further assess surface water and groundwater interactions.	4	$$$*	M	M	H	M	M	
36	5) Project to conduct seepage runs along major watercourses: Conduct seepage runs to further assess surface water and groundwater interactions. Correlate groundwater level data from wells in the vicinity of stream gauges to further establish connectivity of the creek water and groundwater.	2	$	M	M	H	M	M	
37	6) Project to conduct stable isotope study to understand surface water-groundwater flow: Analyze existing samples and collect new surface water and groundwater samples for isotopic and other natural or anthropogenic tracers to evaluate surface water and groundwater interactions.	0	$$	M	L	M	M	L	
5.2.1.5	*Hydrometeorological Monitoring*								
38	1) Develop inventory of existing hydrometeorological stations including sensors, data collection and management protocols, and plans for future expansion.								
39	2) Develop a protocol and work plan for compiling rainfall data on a water-year basis to develop isohyetal maps as warranted, for comparison with groundwater level trends, to augment periodic GMP reports and update the model.	5	$*	H	H	M	H	H	
40	3) Evaluate rainfall data distribution and determine the need for additional data: Consider CoCoRAS and automated systems for possible rainfall monitoring station expansion, and develop plans for future efforts.	4	$	H	H	H	H	H	
41	4) Identify and develop strategies for collecting hydrometeorological data needs for the surface water-groundwater flow model, working with *and leveraging resources of* the NOAA Earth Sciences Research Laboratory, Scripps Center For Western Weather and Water Extremes and USGS.	2	$	M	M	H	H	H	Would we set up our own stations?
5.2.1.6	*Monitoring And Reporting Protocols*								
42	1) Develop a schedule to coordinate the time of sampling and the sampling interval (time between samples) to ensure consistent data collection frequency.								
43	2) Use a Standard Operating Procedure (SOP) for the collection of groundwater level data for wells (Appendix __).								
44	3) Provide DPH guidelines on the collection, pretreatment, storage, and transportation of water samples intended for water quality analyses (Appendix __).								
45	4) Develop field and office quality assurance practices for the program. For future individual studies in the Plan Area, review project-specific quality assurance/quality control procedures for collecting groundwater quality samples.								
46	5) At the onset of the GMP monitoring program, prepare and distribute a stand-alone Sampling and Analysis Plan incorporating the management program component elements for use by monitoring organizations.								
47	6) Provide training on water level sampling to volunteer well owners as needed.								
48	7) Coordinate the various existing and planned monitoring efforts to ensure uniform, standard water quality data collection protocols are followed.	3	$	M	H	H	M	H	
5.2.1.7	*Data Management*								
49	1) Maintain and update the central GIS data management system including GIS layers and other data formats related to groundwater, hydrology, geology, land use, and relevant imagery.								

Item No.	Recommended Action	TAC Initial Screening Process	Relative Cost	Readiness to Proceed	Feasibility/Implementability	Leveraging Opportunity	Community & Political Support	Multi-Objective/Supports Watershed Health	Notes
50	2) Work with cooperating agencies, including DWR, Cotati, Rohnert Park, Santa Rosa, Sebastopol, Windsor, PRMD, and any other non-governmental entity, to provide data for updating the database periodically.								
51	3) Adopt flexible, standard formats for data collection, transfer protocols, reporting, and quality assurance-quality control checks to facilitate regularly scheduled data updates.								
52	4) Use the GIS data management system to assist in periodic data evaluations and prepare the Periodic Plan report summarizing groundwater conditions within the Plan Area and documenting groundwater management activities conducted in the previous year while protecting any confidential information, per requirement of Water Code, Division 7, Chapter 10, Article 3, Section 13752.								
53	5) Project to compile, screen and review State Department of Public Health, DWR Well Logs and PRMD records as an additional data source, especially for aquifer test data and parameters, to improve aquifer parameterization and maps.	4	$$	M	M	M	M	M	Needs plan
54	6) Make data in the GIS data management system data publically available to Plan Area stakeholders and the wider public, while protecting any confidential information.	2	$$*	M	M	M	H	H	Needs plan
55	7) Project to develop and coordinate related data including GIS layers and other data formats on topics that include low flow conditions, recharge and discharge areas, impervious areas, land cover, drainage networks, historical hydrology and land cover, seasonal springs and areas of seepage, and wetlands distribution.	2	$$*	M	M	H	M	H	Needs plan
5.2.2	*Groundwater Modeling*								
56	1) Develop and run groundwater management scenarios using the model to assess the benefits of different recommended actions and options.	NA							
57	2) Assess optimal hydrologic monitoring locations to help best address the most significant model limitations and uncertainties.	NA							
58	3) Periodically update the integrated surface water-groundwater flow model (GSFLOW) including GIS layers and other data formats related to groundwater, hydrology, geology, land use, and relevant imagery.	NA	$$*	H	H	H	H	H	
5.3.1	*Maintain Groundwater Levels*								
59	1) Should monitoring data indicate persistent groundwater level declines in a particular part of the Plan Area, provide notifications to groundwater users regarding declining trends to promote awareness of the issue and foster increased conservation efforts and reduced groundwater demands.	6	$	L	M	H	H	H	Needs plan, monitoring program in place & notification list
60	2) Support and enhance water conservation goals for reducing groundwater demands, with local and region-wide incentive programs.	6	$	M	M	H	M	H	Needs survey, plan & incentives
61	3) Evaluate historical groundwater level trends in the Plan Area, and identify subareas and scenarios that are more vulnerable to groundwater level declines.	4	$	M	M	M	H	H	Needs plan
62	4) Provide information to the public on the importance of groundwater monitoring, maintaining groundwater levels and promoting voluntary groundwater level monitoring across the Plan Area.	4	$	H	H	H	M	H	Incentives helpful
63	5) Where feasible, promote and support small- and large-scale groundwater recharge, water conservation and increased recycled water use to help maintain groundwater levels and reduce groundwater demands.	1	$	M	M	M	M	H	
5.3.2	*Prevent Adverse Interactions Between Surface Water and Groundwater*								
64	1) Encourage activities that protect surface water quality with a particular focus on areas where surface water recharges groundwater.	4	$	M	M	M	L	H	Needs plan and study
65	2) Support a surface water-groundwater interaction monitoring program to better understand the potential for adverse interactions and identify vulnerable areas.	2	$*	M	H	M	M	H	Needs plan and program

Item No.	Recommended Action	TAC Initial Screening Process	Relative Cost	Readiness to Proceed	Feasibility/Implementability	Leveraging Opportunity	Community & Political Support	Multi-Objective/Supports Watershed Health	Notes
66	3) Where reductions in streamflow related to shallow groundwater level declines may be identified, inform local stakeholders and encourage activities to adjust the amount, location and/or timing of groundwater pumping to reduce potential impacts. Such activities may include additional conservation measures, adjusting pumping scenarios spatially and in time, and using alternative water sources if available.	1	$$	L	L	L	L	H	Needs plan, studies, program and analysis
5.3.3	*Well Construction, Maintenance, Protection, Abandonment and Destruction*								
67	1) Review Chapter 25B and provide suggestions to PRMD on the well permit application requirements to improve the collection of hydrogeologic information through working with drillers, well owners, and other parties familiar with groundwater conditions in the Plan Area.								
68	2) Identify management approaches that can be used to protect the water supply from potentially contaminating activities including voluntary control measures, public education, zoning restrictions or ordinances, development of contamination contingency plans, and minimizing pollution around wellhead protection zones.	3	$	M	M	L	M	H	Needs plan
69	3) Conduct an inventory and survey of active and inactive wells in the Plan Area to identify potential abandoned wells, and develop an approach for possible grant funding which would provide incentives to properly destroy abandoned wells. Prioritize efforts in areas where known improperly abandoned wells are known to present water quality concerns.	3	$$*	M	L	M	M	H	Needs plan
70	4) Distribute the Wellness Guide to local well owners within the Plan Area which covers the County's well construction, abandonment and destruction requirements, well head protection information, and tips for ensuring that wells are properly maintained, and monitoring*; also redistribute after a real property transaction.*	3	$*	H	H	H	H	H	
71	5) Provide *recommendations*, as appropriate, to Sonoma County on well construction and destruction for well owners, operators, and licensed well drillers and service providers.	2	$	M	M	M	M	H	Needs plan and notification list
72	6) Review the USGS report on the Santa Rosa Plain (USGS, 2013) and *provide information and maps on groundwater conditions to the County.*	1	$	M	M	M	H	H	Needs plan
73	7) *Conduct a study to obtain better information during well installations by designing a program* to obtain better hydrogeologic information on new well completions in the Plan Area. Such information can be obtained by requesting, on a voluntary basis, the well permittee to allow for collection of additional geologic information during drilling.	0	$	M	L	M	M	H	Needs plan
5.3.4	*Mapping and Protecting Groundwater Recharge Areas*								
74	1) Provide the groundwater recharge area map to and meet with PRMD, the County and local planning agencies to be sure that of groundwater recharge factors are considered in local land use planning decisions.								
75	2) Provide recommendations on the areas that are most vulnerable to loss of recharge capacity and to water quality impacts from land use activities.	5	$	M	M	M	M	H	Needs plan
76	3) Collaborate with local organizations (e.g., the Sonoma County Agricultural Preservation and Open Space District, Land Trust, etc.) to encourage protection and preservation of recharge areas.	3	$	H	H	H	H	H	Needs plan
77	4) Develop site/project guidelines and provide recommendations for protecting groundwater recharge areas and on the areas that are most vulnerable to loss of recharge capacity and to water quality impacts from land use activities.	3	$	M	M	M	H	M	Needs plan and info
78	5) Discourage land use activities in recharge areas that have higher potential to contaminate groundwater resources.	2	$	M	M	M	H	M	Needs plan and info
79	6) Periodically update the recharge area map as new information becomes available through future studies and monitoring programs.	0	$$*	M	H	M	H	L	
5.3.5	*Evaluate Distribution and Remediation of Contaminated Groundwater*								
80	1) Provide rural well owners with Sonoma County Department of Health Services guide, *What You Need to Know About Water Quality in Your Well*.								

Item No.	Recommended Action	TAC Initial Screening Process	Relative Cost	Readiness to Proceed	Feasibility/Implementability	Leveraging Opportunity	Community & Political Support	Multi-Objective/Supports Watershed Health	Notes
81	2) Coordinate periodically with the RWQCB and Sonoma County Environmental Health Department regarding any new reports of contaminant sites that are potential threats to groundwater.								
82	3) Incorporate GIS layers showing mapped contaminant plumes and contaminant sites, supplied by the Regional Water Quality Control Board (RWQCB) and Sonoma County Environmental Health Department into the GIS data management system.	1	$	M	M	M	H	M	Needs plan
83	4) Share available information on impacted wells, mapped contaminant plumes and contaminant sites with Plan Area licensed water system operators and private well owners.	2	$	M	L	M	M	L	Needs plan and info
5.3.6	*Identify and Provide Information to the Public on Groundwater Protection*								
84	1) Conduct a periodic forum on groundwater in the Plan Area and develop educational materials in hard copy, electronic for web-based sites and YouTube, and make them easily accessible on the Plan Project website.	3	$*	M	H	H	H	M	Needs plan and info
85	2) Review and as necessary and appropriate, update the ***WELLness – A Guide to You Water Well*** document, prepared by the Sonoma County Department of Environmental Health Services, to address the Plan objective for this management component. Post the updated guide on the Plan Project website for easy access, and distribute information to the public on the availability of this resource.	2	$	M	H	H	H	L	Needs plan and updated document
5.4.1	*Continue and Increase BMPs for Urban Water Conservation*								
86	1) Continue Implementing BMPs and Report Annually: continue implementing, maintaining and updating CUWCC BMPs, as appropriate, for urban areas. Annually report estimated savings for ongoing water conservation programs.								
87	2) Increase water use efficiency and demand reduction by shifting landscape irrigation to evenings, and so reduce evapotranspiration. Include development of educational materials and a public outreach component.	3	$	H	H	M	H	L	Needs plan and info
88	3) Assess current successes and develop potential options to increase BMPs for urban water conservation.	1	$$	M	M	H	M	M	Needs plan and info
5.4.2	*Voluntary Water Conservation BMPs for Unincorporated Areas*								
89	1) Develop or utilize existing water conservation BMPs for voluntary non-viticulture agricultural and agricultural-residential water users, and adding additional water conservation measures for agricultural operations.	5	$$	M	M	M	M	L	Needs plan, info and grant funding
90	2) Develop or utilize existing programs and technical assistance available for water savings through vineyard irrigation efficiency and other practices.								Not ranked: added to final draft
91	3) Encourage viticulture agriculture to increase water conservation by developing new or using existing BMPS.	2	$	H	M	M	M	M	Needs plan and program info
92	4) Encourage rangeland agriculture to increase water conservation by developing or using existing BMPS.								Not ranked: added to final draft
93	5) Develop program, incentives and funding for voluntary implementation of CUWCC water conservation BMPs in the unincorporated County areas not served by Contractors.	4	$$*	L	L	M	H	L	Needs plan, info and grant funding
94	6) Develop incentives for conservation BMP retrofits in unincorporated County areas not served by Contractors.	3	$$*	L	L	M	H	L	Needs plan, info and grant
5.5.1	*Stormwater Recharge by Infiltration*								
95	1) Evaluate the success (or lack thereof) of local agencies stormwater management efforts over the past 10 years, in order to define where additional effort is appropriate.	NA	$	M	M	M	M	L	
96	2) Conduct feasibility level analysis and pilot scale testing of stormwater capture and groundwater recharge to assess volumes, timing, best locations, estimate costs and potential benefits of implementation.	5	$$	M	M	H	H	M	Needs plan
	3) Project to develop and implement pilot-scale and subsequent large-scale projects to recharge groundwater with stormwater runoff capture and rainfall harvesting in the Plan Area. Examples include:								

Item No.	Recommended Action	TAC Initial Screening Process	Relative Cost	Readiness to Proceed	Feasibility/Implementability	Leveraging Opportunity	Community & Political Support	Multi-Objective/Supports Watershed Health	Notes
97	a) Off-stream spreading basins and percolation ponds. b) Temporary wet season flooding of public lands such as parks or open space. c) Rainfall harvesting and stormwater runoff recharge with dispersed, low impact development infiltration trenches and dry wells, with possible incentives for retaining water on-site	5	$$$	L	M	H	H	H	Needs plans and iterative pilots for large-scale recharge
98	4) Collect and analyze stream gauge data to evaluate potential stormwater capture projects.	4	$	M	M	H	H	L	Needs plan
99	5) Incorporate water quality sampling of high flow surface water and storm water flows on project specific basis for recharge.	2	$*	L	M	M	M	M	Needs projects
100	6) Project to make controlled releases of captured stormwater to streams during late summer and early fall when conditions are typically dry in order to maximize the aquifer recharge and improve fish habitat conditions.	1	$$	L	L	H	H	H	Needs studies and projects
5.5.2	*Aquifer Storage and Recovery and Groundwater Banking*								
101	1) Conduct pilot scale testing of groundwater banking using drinking water from the Russian River to assess feasibility, potential water quality interactions, volumes, monitoring needs, timing, best locations, estimate costs and potential benefits of implementation.	4	$$	M	H	H	M	M	Plan in development
102	2) Based on results from pilot-level ASR groundwater banking, assess the need for additional studies to further evaluate project- and regional opportunities for expanded conjunctive use in the Plan Area.	2	$	L	H	H	M	L	Plans and studies needed
103	3) Develop and implement full-scale ASR groundwater banking projects that use wet season and wet year Russian River drinking water for groundwater banking.	1	$$$	L	H	H	M	H	Plans and pilots needed
5.5.3	*Surface Water Use In Lieu of Groundwater*								
104	1) Evaluate potential funding opportunities for an in lieu recharge program.	1	$	M	M	M	H	M	Plan and study needed
105	2) Develop an integrated surface water/groundwater supply program to guide the conjunctive use of surface water and groundwater in a coordinated fashion. Parameters for the program would likely incorporate yearly and monthly climactic scenarios (e.g., precipitation and reservoir storage levels), historical groundwater pumping, groundwater level trends, and anticipated demands.	0	$$	L	M	M	H	M	Needs plans and studies
5.5.4	*Low Impact Development (LID) in New Construction*								
106	1) Provide information to local community planners and developers on the Water Smart Development Guide and promote LID in new construction.								
107	2) Provide information to rural property on the *Slow It Spread It Sink It Guide* and promote LID in rural settings.								
108	3) Develop incentives for local communities to employ LID in new construction such as reduced connection and permitting fees.	0	$	L	L	M	H	M	Needs plan and study
5.6.1	*Increase Recycled Water for Agricultural Irrigation*								
109	1) Where feasible, promote and support increased recycled water use for large and small scale agricultural irrigation to reduce groundwater demands.	5	$	M	H	H	M	M	Needs plan & info
110	2) Coordinate with local wastewater treatment plant operators to catalogue current operations and agricultural recycled water applications in the Plan Area.	2	$	M	M	M	M	L	Needs plan & cooperation
111	3) Evaluate opportunities for the use and storage of recycled water for agriculture during the wet season, and subsequent use during the dry season.	2	$	L	L	H	M	M	Needs plan and analysis
112	4) *Provide ongoing public education and outreach to local communities regarding recycled water use for agricultural irrigation, and to gage and address public concerns.*	1	$*	M	H	H	H	L	Needs plan & study

Item No.	Recommended Action	TAC Initial Screening Process	Relative Cost	Readiness to Proceed	Feasibility/Implementability	Leveraging Opportunity	Community & Political Support	Multi-Objective/Supports Watershed Health	Notes
5.6.2	*Increase Recycled Water for Landscape Irrigation*								
113	1) Promote and develop incentives for the installation of purple piping in new developments in areas where recycled water availability may increase.	4	$	L	M	M	M	M	Needs plan & cooperation
114	2) Provide ongoing public education and outreach to local communities to continue to promote expansion of recycled water use, and to gage and address public concerns.	2	$*	L	M	M	H	L	Needs plan and study
115	3) Coordinate with local wastewater treatment plant operators to catalogue current operations and landscape recycled water applications in the Plan Area.	2	$	M	M	M	M	L	Needs plan & cooperation
116	4) Evaluate opportunities for the use and storage of recycled water for landscape irrigation during the wet season, and subsequent use during the dry season.	2	$	L	L	M	M	M	Needs plan and analysis
5.6.3	*Graywater for Domestic Landscape Irrigation*								
117	1) Make information available to the pubic that graywater systems are eligible for financing under the Sonoma County Energy Independence Program.	3	$	M	H	H	M	L	Needs plan & info
118	2) Encourage and promote expanded graywater use by local authorities providing financial incentives such as rebates or low-interest financing and by offering free technical support.	2	$	L	L	M	M	L	Needs plan, info and grant funding
119	3) Develop and make readily available educational material that can help ensure that homeowners properly install and maintain graywater systems, including backflow prevention.	2	$*	M	H	M	H	L	Needs plan & info
120	4) Encourage and promote local agencies and communities to develop plans and policies regarding graywater permitting requirements and potential public education efforts.	2	$	M	H	M	M	L	Needs plan & info
5.7.1	*Groundwater Management and Land Use Planning*								
121	1) Brief local agency planning departments periodically on groundwater management program activities and milestones.								
122	2) Conduct an annual or biennial meeting between the Plan Panel and TAC and local agency planners in the Plan Area to exchange information on processes and programs, and to identify constraints and barriers.								
5.7.2	*Monitor and Track UWMP Progress and Incorporate Revisions into GMP Updates*								
123	1) Obtain updates of all UWMPs prepared in the Plan Area every five years.								
124	2) Incorporate updated UWMP information into the GMP every five years.								
5.7.3	*Incorporate Multi-Agency and -Organization Integration into GMP*								
125	1) Develop an inventory of all agencies and organizations with water-related interests, mandates or jurisdiction within the Plan Area and provide information to the identified agencies and organizations on the Panel's efforts and recommended actions.	2	$	M	H	M	H	M	Needs plan & info
126	2) Conduct workshops with and for interested agencies and organizations, as needed, to identify opportunities for integrating overlapping or supporting interests to optimizing efforts, resources, and outcomes.	2	$	M	M	M	H	M	Needs plan, info & program
5.7.4	*Plan for Climate Change*								
127	1) Provide information to increase public awareness of current and future water supplies, demands, and trends in reliability related to a changing climate.	5	$	M	H	H	H	M	Needs plan & info
128	2) Provide information on projected climate changes in the Plan Area to federal, state, local agencies and other organizations involved with water and land use planning.	2	$	M	H	H	H	M	Needs plan & info

Item No.	Recommended Action	TAC Initial Screening Process	Relative Cost	Readiness to Proceed	Feasibility/Implementability	Leveraging Opportunity	Community & Political Support	Multi-Objective/Supports Watershed Health	Notes
129	3) Hold a facilitated workshop on climate change in the Plan Area involving federal, state and local agencies and organizations involved in water and land use planning.	2	$	L	H	M	H	M	Needs plan, info and program
130	4) Develop possible adaptation measures to consider and implement.	NA	$	M	H	M	H	M	Needs plan, info and program
5.7.5	*Multi-Benefit Actions and Activities*								
131	1) Identify funding opportunities, project criteria, and the schedule to apply for funds for multi-benefit activities, actions and projects for the Plan Area.	7	$	M	H	H	H	H	Needs plan
132	2) Hold a TAC meeting focused on discussing future potential multi-benefit activities, actions and projects for the Plan Area.	5	$	M	H	-	H	H	Needs plan
133	3) Prepare a list of Panel Principles to encourage the development of activities, projects and programs that provide multi-benefit outcomes.	2	$	M	H	-	H	H	Needs plan & Panel direction
134	4) Develop an inventory of multi-benefit activities, actions and projects currently being implemented or planned in the Plan Area.	1	$	M	H	H	H	H	Needs plan and inventory

* Indicates relative cost has a long-term annual or periodic funding need
\- Indicates that the High-Medium-Low screening criteria does not apply
NA Indicates that it is not applicable

Table H-2
Criteria for Screening and Prioritization of Recommended Actions
Santa Rosa Plain Groundwater Management Program

1) **Relative Cost** – qualitative approximation of the relative cost of the recommended action
   - High ($$$) – very high cost relative to other actions ($millions)
   - Medium ($$) – in between high and low
   - Low ($) – Low cost ($1000's-10,000's), and may be addressed with staff/in-kind services

   * - indicates a long-term annual or periodic funding need
2) **Readiness to Proceed** – recommended actions that are ready to proceed in a relative sense to one another
   - High – can proceed with little or no preparation
   - Medium – needs preparation of a workplan and or studies
   - Low – Needs plans and studies and likely a pilot to initiate
3) **Feasibility/Implementability** – recommended actions are considered in terms of relative complexity and likelihood of successful completion
   - High – low complexity and high likelihood of successful completion
   - Medium – medium complexity and likelihood of successful completion
   - Low – high complexity and uncertain likelihood of successful completion
4) **Leveraging Opportunity** – recommended actions that can leverage multiple resources, multiple partners, and integrate several key opportunities are considered higher than those that do not
   - High – High likelihood of leveraging resources and opportunities
   - Medium – may be a possibility of leveraging resources
   - Low – Low likelihood of leveraging resources and opportunities
5) **Community and Political Support** – actions that have potential for community and political support are considered higher than those with poor potential support
   - High – High community and political support
   - Medium – Mixed or neutral community and political support
   - Low – Community and/or political opposition
6) **Multi-Objective/Supports Watershed Health** – Integrated projects that fulfill multiple objectives of the groundwater management plan and support overall watershed health, including aquifer recharge protection and enhancement, water quantity and quality, flood mitigation, and habitat protection, are considered higher than those that do not
   - High – Meets many objectives and actions to support watershed health
   - Medium – Meets a few objectives and actions to support watershed health
   - Low – Meets little or no objectives and actions to support watershed health